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Improved Tobacco-cutter.

This machine has one of the most ingenious and simple attachments for feeding tobacco to the cutter that we have ever seen. It consists merely, of a toothed plate, A, working on oval centers, and fitted with springs which bear on the upper side of the oval center, and force the toothed plate in at the top. The top edge, B, is turned over; this edge strikes against an inclined plane, C, when the cutter is worked and is thereby thrown outward. This causes the lower or toothed portion to move inward, which it does, carrying the tobacco a certain distance, limited by the set-screw, D. The plate, A, is forced into the tobacco by the spring, bearing on the oval center, The dotted lines in Fig. 2 show the relative position of the feeding plate and the cutter, when the latter is down. There is, in addition, a follower, F, which confines the tobacco to be cut, and a side gage, G, to carry it straight. The cutter itself is operated by the lever, H, and cam, I, which is cast solid on it. The cutter slides in a frame, J, and has an even noiseless action. It will readily be seen that in working the handle the inclined plane, C, forces the lower toothed edge into the tobacco at every stroke of the handle, and that as it acts before the knife the tobacco is always ready to be cut. All adjustments are performed by the set-screw before-mentioned. The whole instrument is secured to a neat black-walnut base, and is both handsome and efficient.

A patent is now pending on it through the Scientific American Patent Agency, by Richard Smith. For further information address J. L. Walton, of Sherbrooke, Canada.

SMITH'S TOBACCO-CUTTER.

Raising Sunken Vessels.

When a steamer sinks in deep water there is great difficulty in raising her, from the dead weight of the boilers and machinery. Plans innumerable have been propounded for achieving the object, but none have been successful. The latest attempt was that tried to get the screw steamship *City of New York* off Daunt's Rock, which proved a failure. The *Baron Osy*, Antwerp steamer, was floated from the bank in Limehouse Reach, but she stood upright, and at low water was sufficiently exposed for advantageous operations. One cause of failure is to be looked for in the insuperable difficulty of securing the chains. If a paddle-wheel vessel lies on her beam ends, passing chains round her is next to impossible, if no measures are taken to pull her upright by steamtugs; for the sponson boxes and wheels are in the way. The efforts made to save the *Chevy Chase*, a valuable steamer, have been altogether of a novel character. A single row of piles was driven all round her, and outside of these a canvas sheathing was secured with bags of clay to keep the canvas firmly on the ground. When this improvised cofferdam was completed, five steam engines were set in motion to pump out the water, but after several days' exertion the water could not be reduced. The reason is apparent; for, as the water was pumped out, the exterior pressure from tidal influence would be sufficient to lift the sand bags, and so let in the water from below in quantity nearly equal to that ejected from above If the bed of a river for about 260 feet was a dead level, with no inequalities, we could comprehend how this plan might perchance secure the end; but as it would be impossible to select a perfect plane in the bed of any river, we can hardly admire this engineering scheme. In theory it sounds very plausible, for if the cofferdam could be emptied for a few hours the leak might be patched up and the ship floated. Some other scheme will now have to be considered. Of course it is open to the owners of the *Chevy Chase* to make a perfect cofferdam, and so put all risks beyond doubt; but will it pay? This is a mere question of figures. By driving a second row of piles, planks could be let in and made water-tight in the ordinary way. For such a heavy vessel we suspect there is nothing better than the application of air. In theory, there is nothing more plausible than the plan of driving the water out of a vessel by air bags, through the action of force pumps. The drawback, however, to this admirable scheme, is the placing of the bags in the ship to be lifted. If the cargo is in the holds, or the mud and sand supply the place of cargo, there is no room for the inflation of deep-sea or submerged balloons.—Where steam pumps can be effectively employed to expel water faster than it can enter through a leak, a ship must rise, but it too frequently happens that the damage is too extensive to permit of the water being kept under. The true secret seems to rest in distributing the buoyant agency over the entire hull. This can be best accomplished by the use of cylinders. On the coast, vessels are lifted off the beach by empty barrels, where a false bottom cannot be made. If one of these casks gives way, there is no mischief done, but if two large dummies or steamers are engaged to float a vessel, the failure of one is tantamount to a complete break-down. Again, where large vessels are employed, the stress on the chains stretches, and then breaks the links; for the tension is out of proportion to the bearing strain. There are no better appliances for lifting than old tubular boilers, with the tubes taken out, and made water-tight. Cylinders made for the purpose would cost too much money; but metal tubes of any kind, if attached in sufficient numbers to chains round the vessel, and to balks of timber let under the beams, all bearing equal strain, would be the most likely plan to float the ship. These might be supplemented by air-pumps, inflating canvas, india-rubber, or composition bags; but to lift hundreds of tuns the buoyant agents must possess strength. Air balloons have been tried on the surface, but they have burst, and have not been strong enough. A substantial iron tube admits of the chains being passed round it without fear of cutting through; and these are the right kind of things to employ if there are plenty of them and they are properly secured.—*Mitchell's Steam Shipping Journal.*

HOMBERG'S PYROPHORUS.—Mix equal weights of alum and brown sugar and stir over the fire until thoroughly dry; then put in a glass bottle and heat to redness without exposure to the air. It takes fire spontaneously when the air has free access to it.

SIR CHARLES LYELL AT BATH.

The thirty-fourth anniversary of the British Association was recently commemorated by a meeting at Bath, under the presidency of Sir Charles Lyell. This eminent geologist very naturally devoted a large portion of his opening address to the geology of the Bath hot springs. We make a few extracts from the address of general interest.

THE GASES OF HOT SPRINGS.

Dr. Daubeny, after devoting a month to the analysis of the Bath waters in 1833, ascertained that the daily evolution of nitrogen gas amounted to less than 250 cubic feet in volume. This gas, he remarks, is not only characteristic of hot springs, but is largely disengaged from volcanic craters during eruptions. In both cases he suggests that the nitrogen may be derived from atmospheric air, which is always dissolved in rain water, and which, when this water penetrates the earth's crust, must be carried down to great depths, so as to reach the heated interior. When there, it may be subjected to a deoxidising process, so that the nitrogen, being left in a free state, may be driven upward by the expansive force of heat and steam, or by hydrostatic pressure. This theory has been very generally adopted, as best accounting for the constant disengagement of large bodies of nitrogen, even where the rocks through which the spring rises are crystalline and unfossiliferous. It will, however, of course be admitted, as Professor Bischoff has pointed out, that in some places organic matter has supplied a large part of the nitrogen evolved. Carbonic acid gas is another of the volatilized substances discharged by the Bath waters. Dr. Gustav Bischoff, in the new edition of his valuable work on chemical and physical geology, when speaking of the exhalations of this gas, remarks that they are of universal occurrence, and that they originate at great depths, becoming more abundant the deeper we penetrate. He also observes that when the silicates, which enter so largely into the composition of the oldest rocks, are percolated by this gas, they must be continually decomposed, and the carbonates formed by the new combinations thence arising must often augment the volume of the altered rocks. This increase of bulk, he says, must sometimes give rise to a mechanical force of expansion capable of uplifting the incumbent crust of the earth; and the same force may act laterally, so as to compress, dislocate, and tilt the strata on each side of a mass in which the new chemical changes are developed. The calculations made by this eminent German chemist of the exact amount of distention which the origin of new mineral products may cause, by adding to the volume of the rocks, deserve the attention of geologists, as affording them aid in explaining those reiterated oscillations of level—those risings and sinkings of land—which have occurred on so grand a scale at successive periods of the past. There are probably many distinct causes of such upward, downward, and lateral moments, and any new suggestion on this head is most welcome; but I believe the expansion and contraction of solid rocks, when they are alternately heated and cooled, and the fusion and subsequent consolidation of mineral masses will continue to rank, as heretofore, as the most influential causes of such movements.

DIFFERENCE BETWEEN NATURAL AND ARTIFICIAL SPRING WATER.

Professor Roscoe, of Manchester, has been lately engaged in making a careful analysis of the Bath waters, and has discovered in them three metals which they were previously not known to contain—namely, copper, strontium, and lithium; but he has searched in vain for cæsium and rubidium, those new metals, the existence of which has been revealed to us in the course of the last few years by what is called spectrum analysis. By this new method the presence of infinitesimal quantities, such as would wholly have escaped detection by ordinary tests, are made known to the eye by the agency of light. Thus, for example, a solid substance such as the residue obtained by evaporation from a mineral water is introduced on a platinum wire into a colorless gas flame. The substance thus volatilized imparts its color to the flame, and the light, being then made to pass through a prism, is viewed through a small telescope or spectroscope, as it is called, by the aid of which one or more bright lines or bands are seen in spectrum, which, according to their position, number, and color, indicate the presence of different elementary bodies. Professor Bunsen, of Heidelburg, led the way, in 1860, in the application of this new test to the hot waters of Baden-Baden, and of Durkheim, in the Palatinate. He observed in the spectrum some colored lines of which he could not interpret the meaning, and was determined not to rest till he had found out what they meant. This was no easy task, for it was necessary to evaporate 50 tuns of water to obtain 200 grains of what proved to be two new metals. Taken together, their proportion to the water was only as one to three millions. He named the first cæsium, from the bluish-gray lines which it presented in the spectrum; and the second rubidium, from its two red lines. Since these successful experiments were made, thallium, so called from its green line, was discovered in 1861 by Mr. Crookes; and a fourth metal, named indium, from its indigo-colored band, was detected by Professor Richter, of Freiberg, in Saxony, in a zinc ore of the Hartz. It is impossible not to suspect that the wonderful efficacy of some mineral springs, both cold and thermal, in curing diseases, which no artificially-prepared waters have as yet been able to rival, may be connected with the presence of one or more of these elementary bodies previously unknown, and some of the new-found ingredients, when procured in larger quantities, may furnish medical science with means of combating diseases which have hitherto baffled all human skill.

LITHIUM.

While I was pursuing my inquiries respecting the Bath waters, I learnt casually that a hot spring has been discovered at a great depth in a copper mine near Redruth, in Cornwall, having about as high a temperature as that of the Bath waters, and of which, strange to say, no account has yet been published. It seems that in the year 1839 a level was driven from an old shaft, so as to intersect a rich copper mine at the depth of 1,350 feet from the surface. This lode or metalliferous fissure occurred in what were formerly called the United Mines, and which have since been named the Clifford Amalgamated Mines. Through the contents of the lode a powerful spring of hot water was observed to rise, which has continued to flow with undiminished strength ever since. At my request Mr. Horton Davy, of Redruth, had the kindness to send up to London many gallons of this water, which have been analyzed by Professor William Allen Miller, F. R. S., who finds that the quantity of solid matter is so great as to exceed by more than four times the proportion of that yielded by the Bath waters. Its composition is also in many respects very different; for it contains but little sulphate of lime, and is almost free from the salts of magnesium It is rich in the chlorides of calcium and sodium, and it contains one of the new metals cæsium, never before detected in any mineral spring in England; but its peculiar characteristic is the extraordinary abundance of lithium, of which a mere trace has been found by Prof. Roscoe in the Bath waters; whereas in this Cornish hot spring this metal constitutes no less than a twenty-sixth part of the whole of the solid contents, which, as before stated, are so voluminous When Professor Miller exposed some of these contents to the test of spectrum analysis, he gave an opportunity of seeing the beautiful bright crimson line which the lithium produces in the spectrum. Lithium was first made known in 1817 by Arfvedsen, who extracted it from petalite, and it was believed to be extremely rare, until Bunsen and Kirchoff, in 1860, by means of spectrum analysis, showed that it was a most widely-diffused substance, existing in minute quantities in almost all mineral waters, and in the sea, as well as in milk, human blood, and the ashes of some plants. It has already been used in medicine, and we may therefore hope, now that it is obtainable in large quantities, and at a much cheaper rate than before the Wheal Clifford hot spring was analyzed, it may become of high value.

CONNECTION OF HOT SPRINGS WITH METALLIC VEINS.

Hot springs are, for the most part, charged with alkaline and other highly soluble substances, and, as a rule, are barren of the precious metals, gold, silver, and copper, as well as of tin, platinum, lead, and many others, a slight trace of copper in the Bath waters being exceptional. Nevertheless, there is a strong presumption that there exists some relationship between the action of thermal waters and the filling of rents with metallic ores. The component elements of these ores may, in the first instance, rise from great depths in a state of sublimation, or of solution, in intensely heated water, and may then be precipitated on the walls of a fissure as soon as the ascending vapors or fluids begin to part with some of their heat. Almost everything, save the alkaline metals, silica, and certain gases may thus be left behind long before the spring reaches the earth's surface. If this theory be adopted, it will follow that the metalliferous portion of a fissure, originally thousands of feet or fathoms deep, will never be exposed in regions accessible to the miner, until it has been upheaved by a long series of convulsions, and until the higher parts of the same rent, together with its contents and the rocks which it had traversed, have been removed by aqueous denudation. Ages before such changes are accomplished thermal and mineral springs will have ceased to act; so that the want of identity between the mineral ingredients of hot springs and the contents of metalliferous veins, instead of militating against their intimate relationship, is in favor of both being the complementary results of one and the same natural operation.

MEAT PRESERVED IN ICE MANY THOUSAND YEARS.

We have now evidence, therefore, of man having co-existed in Europe with three species of elephant, two of them extinct (namely, the mammoth and the *Elephas antiquus*), and a third the same as that which still survives in Africa. As to the first of these—the mammoth—I am aware that some writers contend that it could not have died out many tens of thousands of years before our time, because its flesh has been preserved in ice, in Siberia, in so fresh a state as to serve as food for dogs, bears and wolves; but this argument seems to me fallacious. Middendorf, in 1843, after digging through some thickness of frozen soil in Siberia, came down upon an icy mass, in which the carcass of a mammoth was imbedded so perfect that, among other parts, the pupil of the eye was taken out, and is now preserved in the Museum of Moscow. No one will deny that this elephant had lain for several thousand years in its icy envelope; and if it had been left undisturbed, and the cold had gone on increasing for myriads of centuries, we might reasonably expect that the frozen flesh might continue undecayed until a second glacial period had passed away. When speculations on the long series of events which occurred in the glacial and post-glacial periods are indulged in, the imagination is apt to take alarm at the immensity of the time required to interrupt the monuments of these ages, all referable to the era of existing species. In order to abridge the number of centuries which would otherwise be indispensible, a disposition is shown by many to magnify the rate of change in prehistoric times, by investing the causes which have modified the animate and inanimate world with extraordinary and excessive energy. It is related of a great Irish orator of our day that when he was about to contribute somewhat parsimoniously toward a public charity he was persuaded by a friend to make a more liberal donation. In doing so he apologized for his first apparent want of generosity by saying that his early life had been a constant struggle with scanty means, and that "they who are born to affluence cannot easily imagine how long a time it takes to get the chill of poverty out of one's bones." In like manner, we of the living generation, when called upon to make grants of thousands of centuries in order to explain the events of what is called the modern period, shrink naturally at first from making what seems so lavish an expenditure of past time. Throughout our early education we have been accustomed to such strict economy in all that relates to the chronology of the earth and its inhabitants in remote ages, so fettered have we been by old traditional beliefs, that even when our reason is convinced, and we are persuaded that we ought to make more liberal grants of time to the geologist, we feel how hard it is to get the chill of poverty out of our bones.

The long bridge at Washington, commenced about fifteen months ago, is completed. It is 4,046 feet long, has two draws, each 78 feet long, which are so constructed as to require but two minutes to be opened and shut again. The cost of this bridge is only about $150,000.

WHAT SHALL WE EAT?

We eat just what appetite and inclination prompts us to. Statisticians have prepared tables showing the nutrition contained in certain articles of food, and the time required to digest them in healthy stomachs. These tables are useful as information, but as guides to health they are useless. When a man orders his dinner he does not consult the state of his system, nor examine the tables to see what would suit his condition, but he asks his palate and that decides the momentous question Suppose a man, with a sick headache, for instance, to require nourishment. His ailment proceeds from a disordered stomach, therefore he must humor it and take light diet. Rice naturally occurs to him; so he takes out his work and looks for the article "rice." Rice, says the statistician, digests in one hour when boiled, and is, therefore, wholesome and nutritous. But possibly the invalid dislikes rice. He would much prefer a mutton chop, but is deterred from fear of the statistician, who tells him that mutton requires three hours to digest, and is, therefore, a needless a tax upon his system. But elsewhere in the statisticians book the invalid has read that bulk has some part in this matter of digestion, and that a large amount of easily-digested food may be required to satisfy the cravings of appetite, while an infinitessimal part of the more concentrated is quite as wholesome. More, in point of fact, for the appetite is satisfied by the food the stomach calls for, so that it is easily appeased, and does its work good humoredly, so to speak, even though it be harder.

The philosopher may lay down laws for the guidance of the human stomach, but that independent and rebellious organ disdains them. The skies above us are not more fickle than it. To-day the clouds overcast the heavens, and the aspect is lowering. The stomach that was quite tractable yesterday is insurgent to-day. A breath of anger ruffles it as the wind does the landscape, and no man can set bounds to it.

The best modern writers on physiology tacitly concede points adverted to in this article, and except where the demand is glaringly inconsistent permit invalids to eat the food they crave. The day of slop tea and dishwater soup has vanished from the hospitals; good, wholesome, nourishing broth, the spirit of beef, is given; porter and ale are administered, eggs, farinaceous food, and also mutton chops, beefsteaks and chicken, are served to patients in lieu of the low diet with which it was formerly thought proper to drench sick people. The result is seen in a much lower per centage of mortality and in a more rapid convalescence than with the erroneous ideas of old

A student of Salamanca was enjoined by his careful parent to economize in his expenditures, and, above all, retrench in his commissary department. Stimulated by this advice he repaired to the market and put this query to the dealer :—

"What is the price of cows?"

"Twenty-five dollars."

"What is the price of partridges?"

"Twenty-five cents."

"Ah! very well; partridges are much cheaper than cows; I will take two."

It is perhaps not precisely from these premises that we would argue, but the anecdote is illustrative of the fact that people will eat just what they choose, regardless of economy, so long as they can procure what they please. Dr. Hall, in his *Journal of Health*, relates that five pounds of corn meal made into bread "lasted" a family one week, but subsequent investigation revealed the fact that soda crackers were surreptitiously substituted for the unpalatable corn bread, and that under similar circumstances the loaf might have held out like the widow's cruse of oil.

There is no sacrifice more difficult for society than depriving itself of necessaries, or even luxuries, because they are dear. Thus we see one writer, confessedly without taste, decrying beef and declaring for beans because they are cheaper; still another disclaims against dress, but spends double on his table, and it is only when the article desired cannot be had that men relinquish its use.

What one man can eat with impunity poisons another. The stomach may be *trained* to endure abuse, or digest forbidden food, so to speak, with impunity. The most emaciated dyspeptic may, by practice, bring his stomach to digest buckwheat cakes, while a soda cracker lies flatulent and heavy. It is from this very peculiarity that diseases of the organ in question are so difficult to cure when they become chronic, or seated, as dyspepsia. The medicine that cures in one case has no efficacy in another, and the most powerful stimulants fail where mild tonics restore the lost vitality. What we shall eat is a matter not laid down in text books. The English laborer eats bread and cheese because it is comparatively cheap, and not because the tables say it digests easily. When he comes to this country he takes care to have plenty of beef in addition to the bread and cheese. His health is doubtless quite as good in one case as the other. Ten members of a family may require ten different medicines, and taste is not, as too many suppose, a thing to be disregarded and crushed. It is the instinct of the stomach, telegraphed to the palate and from thence communicated to the will, so that through the exercise of an instinct man orders what he likes for his dinner and keeps his body healthy.

A Subterranean Steam Engine.

The *Territorial Enterprise*, published in Colorado Territory, has the following article, which will be found interesting to engineers:—

...."As we proceeded along the tunnel we met several cars loaded with ore, which rushed past us as we stepped aside, at railroad speed, and at length, when in some hundreds of feet, our ears were greeted by the whizzing of steam. Looking ahead, we saw the tunnel filled with white clouds of vapor, through which candles shone, each encircled by a halo like that about a stormy moon. Through the white mist, dark and indistinct, we could see the figures of men coming and going, almost persuading us that we were approaching the secret laboratories and workshops of the gnomes. Shortly after we stood beside a large steam drum and were told that we were now at the point where the steam is brought down from the boiler, 201 feet above. The steam pipe comes down through a shaft, enters the drum, thence runs along the tunnel 899 feet to the engine, which is over 400 feet below the surface of the mountain. There is a steam gauge affixed to this drum, one at the boiler and another at the engine. The difference in the pressure at the boiler and at the engine, as shown by the gauges, is but five pounds, which is a very slight loss when we consider that the steam is carried through 1,100 feet of pipe. *At the Almaden quicksilver mines, where the steam is carried through 1,300 feet of pipe, the difference in the pressure in the boiler and engine is fourteen pounds. At the Gould & Curry works superheated steam will shortly be used, when the loss of pressure by condensation will be still less than at present. The steam pipe passes along the bottom of the tunnel at one side and rests in wooden boxes, where it is surrounded with ashes tightly packed about it. The steam pipe at the Almaden mines passes along the roof of the tunnel, and is merely wrapped with ropes of straw. We noticed but one or two slight breaks in the whole of the long string of pipe between the engine and at the steam drum at the shaft. The pipe is furnished with expansion joints, which slide together and draw apart, like the joints of a telescope, as the pipe is expanded by heat or contracted by cold. This expansion and contraction is very considerable in so long a pipe.

"The engine room is cut out of the solid rock, and the walls and ceiling are supported by a compact framework of heavy timbers. It is 42 by 22 feet in size. Lamps were placed in rows about the walls, and threw a bright, glaring red light through the moist atmosphere of the place, upon the ponderous machinery, and upon the workmen, who, like the kobolds of old supposed to keep guard over veins of precious metals, flitted to and fro in the sweltering chamber. Once the engine was started a circulation was produced, which made the air of the place much more comfortable. The steam from the engine escapes into some upper chamber of the mine, therefore is productive of no inconvenience to the engine room. The engine works smoothly, and produces but little noise even in this echoing cavern. The friction wheels of the hoisting gear are ten feet in diameter, being, we believe, the largest in the territory.

"The bucket used is constructed of iron, and is a huge affair, holding over a tun. The bucket is dumped into the cars by means of a simple apparatus, operated by a workman who is in attendance for the purpose. The principal feature of this dumping apparatus is a stout iron bar, which, as the bucket ascends, is placed in such a position as to catch it by the bottom when it descends and turn its contents into the car. With this dumping apparatus the danger of accident is much lessened. The main engine shaft is now down nearly 200 feet. The influx of water is very slight, and is productive of no inconvenience. The depth below the surface attained at the bottom of the shaft is over 600 feet. A working level is being opened at the depth of 100 feet from the top of this shaft, and another will soon be commenced at its bottom."

Utility of the Electric Light.

The *Courrier de Bretagne* gives an interesting account of recent experiments with the electric lights at Lorient, France. The night was dark, many spectators assembled, in addition to the engineers and officers comprising a commission appointed specially by the maritime prefect. First, the great dock, in which two ships were under repair, was rendered as light as day, so that the engineers were enabled to go down into it and examine all the details of the repairs. Next a signal mast was fixed, at 700 yards from the *Duchayla*, and at 500 from the *Panama* steam frigates; the signals given by flags from the summit of the mast were rendered perfectly visible on board the two ships by means of the electric light. A third experiment caused great surprise and admiration. A diver descended 20 feet under water, and by means of the light was enabled to distinguish the decimal divisions on a scale which was sent down to him and to give proofs of it. This experiment was deemed conclusive. It is now established that an electro-magnetic machine may be permanently fixed to light large workshops, submarine works, and narrow passages into harbors. It was further observed that when the light was brought to bear on the water shoals of fish were attracted by the unusual appearance, and continued to swim around the part lighted. Eels and other fish which were at the bottom of the sea came up to the surface.

Sound as a Time Measure.

In a recent French work entitled *Traite des Mecanismes*, by M. Haton de la Goupilliere, we find described a curious and ingenious method of measuring time, which gives thousandth parts of a second. The description is substantially as follows:—Suppose it were required to measure the exact time of the descent of the hammer of a gun-lock on the nipple. The motion is so rapid that the most delicate stop-watch is at fault. A needle might be fixed to the hammer, so as in descending to mark a curve on a blackened metal plate; but still the time would be an unknown quantity. It may, however, be measured by means of a tuning-fork, also provided with a marking needle; then while the former one marks the curve described by the hammer, the second needle will mark the vibrations of the fork; and as we know that they are isochronous, each of the small insinuosities thus obtained on the blackened plate will represent a fraction of time, and show how many such fractions elapsed before the fall of the hammer. To give an idea of the degree of precision which may be obtained by this process, let us suppose the normal French tuning-fork, which will perform 896 vibrations in a second; then the duration of each vibration will be 1-896th of a second; and as the greatest error that can be committed cannot exceed half a vibration, the measurement will be exact to 1-1792d of a second.

A GREAT MANUFACTURING CONCERN.—The capital of the Amoskeag Company is three millions. It has cleared ten per cent on the capital. Its chief product has cotton for the foundation, and operations in that line are doubtful till the war ends. It has made 5,842,000 yards of cloth, equal to three thousand three hundred and nineteen miles, the past year, or between ten and eleven miles each working day. That is about one-quarter of what it has done in peace times. Besides, it has manufactured twenty two steam fire engines, fourteen thousand five hundred Springfield rifled muskets, and other machinery.

THE WAY TREES GROW.

At the last meeting of the Farmers' Club, Mr. Bartlett, being called on by the President, made the following report:—

Mr. Chairman, The committee to whom was referred the communication of S. Crosby, respectfully report. The several queries in that communication constitute a request for a general account of the circulation of sap in trees, and the formation of maple sugar. We proceed to give such an account in the briefest and clearest manner at our command.

Trees are made up of fine tubes which extend from the root to the leaf, and it is through these tubes that the circulation of the sap is carried on. If a growing tree is pulled up by the roots, and the roots are placed in a vessel of water containing some colored solution which they will absorb, we can trace the course of this colored solution through the tree by cutting notches into it at successive periods. The coloring matter is always found first in the body of the wood near the root, then in the wood higher up, and so on until it reaches the leaf; then it begins to appear in the inner bark near the leaf, and it passes down through the bark again to the root. This observation shows that the circulation of the sap is up through the wood, and down through the bark.

We are not able to answer the question of your correspondent, what is the force that causes the sap of plants to circulate. There has been much speculation in relation to it, but it has never been settled by observation and experiment. It is pretty well established that sap circulates in the winter, though less rapidly than in the summer, and less rapidly at that time in deciduous than in evergreen trees.

THE FORMATION OF SUGAR IN THE MAPLE.

The solid portions of thoroughly dried wood, and other parts of plants, are composed mainly of water and charcoal. When charcoal is burned, a small portion of ash is left. This ash is the mineral or inorganic portion of the substance of the tree, and consists principally of potash, lime, and flint or silex. That portion which burns is carbon. In burning, the carbon unites with oxygen to form carbonic acid, an invisible gas that floats away in the atmosphere.

The water and the inorganic matters enter the tree through the roots; the carbon enters mostly through the leaves. Carbon forms about one half of the solid substance of the tree, and water the other half.

Water is composed of two elements, oxygen and hydrogen, in the proportion of eight pounds of oxygen to one of hydrogen. These in entering into a chemical combination with carbon, lose the liquid state of water, and form the various solid substances which make up the body of the tree.

In its course the sap undergoes important transformations. The trunks and leaves of trees are scenes of constant chemical operations, many of them more mysterious than any of the operations of the labratory. One of these is the decomposition of carbonic acid in the leaf. The affinity of carbon and oxygen is very strong indeed, and there are few forces in nature that can rend these two elements asunder; but the combined action of light and vegetable life is separating them throughout every day in the leaves of all growing plants. Carbonic acid is absorbed from the atmosphere by the leaf, its two elements are torn apart, the oxygen is returned to the air, and the carbon combining chemically with other elements in the sap is carried to the places where new wood is being formed, and is there deposited in its proper place to help build up the structure of the tree. The symmetrical order in which the carbon is deposited in a tree may be seen by looking at a piece of charcoal.

If wood is examined under a powerful microscope, it is found that the tubes through which the sap circulates are formed of minute sacs or cells. The substance of which the walls of these cells are formed is called cellulose. It has been the subject of a great deal of chemical research, and is found to consist of carbon and water, or more strictly, of carbon and the elements of water, oxygen and hydrogen. Cotton and linen are almost pure cellulose. Each atom of cellulose contains 12 atoms of carbon, 10 atoms of hydrogen and 10 of oxygen, $C_{12} H_{10} O_{10}$. Starch, gum, and sugar all have the same composition $C_{12} H_{10} O_{10}$. This is one of the wonders of chemistry, that substances composed of the same elements, combined in the same proportion, should have properties so different as gum, starch, sugar, and cotton or linen fiber. Their different properties must of course result from the different modes in which the atoms are arranged.

Besides these four substances there is one other constituting a considerable portion of the body of trees, which is also formed of the same elements as the others but in slightly different proportions. This is lignin. It is an incrustation on the inner surfaces of the cell walls, and its office appears to be to strengthen and stiffen these walls. Its constitution is $C_{12} H_8 O_8$. In this case, as in the others, there are just as many atoms of hydrogen as of oxygen; these two elements enter into the compound in the same proportion to each other as that in which they unite to form water. If a tree or other plant is thoroughly dried so as to expel all of its uncombined water, nine-tenths of the remaining substance consists of the five compounds, cellulose, lignin, starch, gum, and sugar, and all of these are composed of hydrogen and oxygen in the same relative proportion as that in which they exist in water, chemically combined with carbon.

Why it is that the atoms of these substances are so arranged in one part of the plant to form cellulose, and in another to form starch; why it is that they are so arranged in one tree as to form gum, and in another to form sugar, are mysteries which lie beyond the present boundaries of human knowledge.

There is one other organic element, and several inorganic, besides those mentioned, which enter, though in small quantities, into the constitution of plants, but a full discussion of the part which they perform in vegetable economy would demand an exhaustive treatise on agricultural chemistry and vegetable physiology. The presentation of this general view of the growth of plants is deemed the most proper discharge of the duties of your committee.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute on Thursday evening Oct. 13, 1864, the President, D. S. Tillman, Esq., in the chair. The regular subject of the evening was

THE PNEUMATIC RAILWAY.

Mr. Garvey, the Secretary, read from the London *Railway News* a description of the railway now in operation at Sydenham, England, substantially the same as that already published in the Scientific American. The *News* pronounced this experiment a success, and this mode of traveling agreeable as well as rapid.

The President :—It is stated that the average pressure on the piston is 2½ ounces per square inch. The size of the tube is not given, but supposing it 10×10 feet=100 square feet, at 22 pounds per foot= 2,200 lbs. on the piston. The tunnel is 1,800 feet long; so the solid contents would be 180,000 cubic feet, and the whole of this air would have to be rarified to produce the pressure. The fringe packing, so far as that goes, is good.

Mr. Roosevelt :—Mr. President, as I proposed this question it will be expected that I should say something upon it. It seems to me that it is the perfection of all modes of travel; that when this is introduced we cannot hope for, or imagine, anything better. It is especially adapted for crossing the rivers out of this city in place of ferry-boats. With tubes, either under the water or over, we can cross very quickly, at any minute, without any delay from ice or other obstructions, and in perfect safety. I hope those who have given more attention to the details of the subject than I have will give us their views.

Mr. Fisher :—I understand, Mr. President, that the scheme of a subterranean railway under Broadway is to be pushed this winter, and efforts are to be made to obtain a charter from the legislature. It will be remembered that when this scheme was discussed some years ago here, I expressed the opinion that the smoke, steam, and gas from the locomotive would make the tunnel unendurable to the passengers. I hold in my hand a letter from the London correspondent of the *New York Herald*, in which he speaks of the tunnel in the subterranean railway in London, where locomotives are used. He says that a number of persons have been taken out in an unconscious state, being nearly deprived of life from the carbonic acid coming from the furnace of the locomotive. A number of the employes of the company have also been prostrated, and it is found impossible for any person to work in the tunnel for any considerable length of time. The numbers of passengers on this road are constantly diminishing. On the other hand, the writer says the pneumatic tube is the delight of all who have tried it. The ventilation is perfect, and the air is remarkably fresh and pure.

Perhaps the high velocity obtainable by the pneumatic tube may bring it into use, but I do not think we are quite ready for it yet. I do not think it is adapted for travel through the streets of cities. The time and power required for getting up such high velocities, and the time required to stop a car when moving so rapidly, render this mode of locomotion unsuitable for street conveyance. A railroad car running 60 miles an hour will run 3 miles after the power is cut off before it will stop.

Dr. Parmelee :—I have examined the air guns in use in the rifle galleries in this city, and I find that the bullet is packed by a fringe analogous to the bristles around the piston in this pneumatic tube. Many other plans have been tried, but this has received the preference.

FARMERS' CLUB.

The Farmers' Club of the American Institute held its regular weekly meeting at its Room at the Cooper Institute, on Tuesday afternoon, Oct. 11, the President, N. C. Ely, Esq., in the chair. From the varied discussion we present only the following:—

PRESERVING CIDER.

Mr. Robinson :—I have here an inquiry if there is any mode of keeping cider sweet except the use of sulphite of lime. The writer says that injures the flavor.

The President :—Cider and wine may be purified by isinglass. Dissolve isinglass in warm water, stir it gently with the wine, let it settle, and then carefully draw off the liquor. You may use about an ounce of isinglass to a gallon of cider. I purified wine in this way thirty years ago. The process takes out some of the fruity flavor of the liquor. It is better to let it settle without the isinglass. "Wine on the lees" is the best now as it was in Scripture times.

Mr. Carpenter :—The main, thing, Mr. Chairman, in keeping cider is to have the barrel clean and sweet, and the cider free from pomace and other impurities.

Mr. Hillsboro :—The best barrel of cider that I ever saw had a handful of alum put into it in November. It did not remain sweet, but the next summer it was a most delicious drink.

A report on the way trees grow was also read and will be found in another place.

The Money Order System.

The postal money order system is to go into effect upon Nov. 1st. This plan is for the transmission of small sums, not less than one dollar and not more than thirty dollars. For the service to the parties interested the following fees or commissions are to be paid in advance by the party who deposits the money. For orders for sums of ten dollars and under, ten cents; over ten dollars and not exceeding twenty dollars, twenty cents; over twenty dollars and not exceeding thirty dollars, thirty cents. A blank for the amount required is to be filled up by the applicant, who must, in all cases, give his own Christian name in full; and when the Christian name of the payee is known, it should be so stated; otherwise initials may be used. The Christian names of married women must be given, and not those of their husbands. For example, Mrs. "*Mary* Brown" must not be described as Mrs. "*William* Brown." Where the order is to be sent by or to a firm, the usual firm name is all that need be given. The order is then given to the party applying for it according to number, stating the amount, but not stating to whom it is payable or who deposited the money. A request is at the bottom of the order that the Postmaster shall pay the money to the person indicated in the letter of advice." The letter of advice is sent by the Postmaster with whom the money is deposited to the Postmaster who is to pay the order, and it contains the names of the depositor and of the person to whom the money is to be paid. The latter is to re-

ceive the order from the former, and most usually it will be sent in inclosure by mail. A party who has possession of an order will be required, before payment it made to him, to state the Christian and surname of the party who sends it and his address, and also his own. This regulation is designed to prevent an unauthorized person from obtaining the amount of an order, should it, by accident, fraud, or theft, fall into improper hands. The Post-office Department will use all fair means to prevent dishonesty, but if an order is once paid to the party presenting it, through misrepresentation, the Government will not be liable to any further claim. The public are therefore cautioned as follows:—

1st, To take all means to prevent the loss of a money order.

2d, Never to send the order in the same letter with the information required on payment thereof.

3d, To be careful, on taking out a money order, to state correctly the Christian name, as well as the surname of the person in whose favor it is to be drawn.

4th, To see that the name and address of the person taking out the money order are correctly made known to the person in whose favor it is to be drawn.

Neglect of these instructions will risk the loss of the money, besides leading to delay and trouble in obtaining payment.

Under no circumstances can payment of an order be demanded on the day of its issue.

If the money is not called for within ninety days after the date of the order, there will be difficulty in obtaining it. The regular form of the order must not be clipped or mutilated. When the payee of an order desires the same to be paid to any other person, he must fill up and sign a form of indorsement, and furnish such second party with the information required to obtain payment of his order, who, upon receiving payment, must sign his name upon the face of the order. More than one indorsement is prohibited by law, and will render the order invalid and not payable.

This system, entirely new to our country, is founded upon the English plan. In Great Britain it has been very useful, and is exceedingly popular. Properly managed it will be in the United States an accommodation which will soon be discovered to be indispensable in the management of business between different sections of the country.—*Philadelphia Inquirer.*

A PRACTICAL ICE-MAKING MACHINE.

A paper was recently read before the British Association by Mr. A. C. Kirk, in which after explaining an ether machine for making ice, he said:—

"Such a machine was in use for fully a year, at the works of Messrs. Young & Co., Bathgate, for cooling the paraffin oil of which they are the well-known makers, in order to extract the solid paraffin it contains, a substance of great value in itself, and whose presence in the oil is otherwise desirable. This machine proving too small for the increasing size of the work, and the use of a material so volatile, inflammable, expensive, and in all respects so dangerous as ether, being a serious drawback, I was requested, in the beginning of 1862, to try if some efficient substitute could not be found. Atmospheric air being the substitute which at once suggested itself to me as not only safe but inexpensive, I commenced a series of experiments, which at last resulted in a small model, by which I was able to freeze mercury. A large machine was immediately proceeded with, which worked so satisfactorily that the use of the ether machine was discontinued, and this year at the works a more powerful one has been erected, capable, if applied to such a purpose, of making three tuns of ice in twenty-four hours. I shall now proceed to describe the nature of this machine, which, it will be seen, is allied to the air-engine in the same manner as the ether machine is to the steam-engine. If we enclose a quantity of air in a strong vessel, into the top of which we fix a common air-syringe, and force the piston downwards by hand, we shall compress the enclosed air, which, by the power so spent, will be heated; and if we now cool the whole apparatus down to its original temperature, and allow the air to force the piston gradually back, the air by the effort will be cooled; but, inasmuch as the cooled air will not occupy the same space as the air originally did, the piston will not return to the point at which it was when we commenced, and thus less power will be given out during the expansion of the air than was spent in its compression. It is not necessary that the air be at the atmospheric pressure: if air of greater density be employed, the cooling power of the machine will be increased. We have thus got an elementary cooling machine, and as before power is spent in working it. To render this a practicable machine, the first thing necessary is to perform the compressing or heating operation, and the expansion or cooling operation in separate compartments; the one surrounded by water to abstract the heat generated, and the other surrounded by the substance to be cooled, or from which heat is to be taken. The one compartment being thus very cold and the other comparatively warm, the next thing is to provide means by which the air can be continually transferred from one to the other, without carrying heat from the hot compartment to the cold. Thus, if the temperature of the hot compartment be 70°, and that of the cold zero, the air must enter the cold compartment preparatory to expansion at a temperature as nearly zero as possible, and in returning to the hot compartment must enter it preparatory to compression, at a temperature as nearly 70 degrees as possible. That beautiful invention of Stirling, the regenerator, or respirator, as it is sometimes called, composed ordinarily of a large quantity of wire gauze, through which the air passes, enables us to accomplish this very perfectly. When the machine is fairly a-going, the layers of gauze next the cool compartment become as cold as the compartment itself, and those next the hot compartment as hot, while the layers between those shade off through the intermediate grades of temperature. Thus the air, in passing from the hot to the cold compartment, warms the gauze and is itself cooled, and the cold air in returning is gradually warmed, cooling the gauze in its course; and although the air is continually being passed backwards and forwards from the hot compartment to the cold, and *vice versa*, no heat is conveyed by it from the hot end to warm the cold and interfere with the cooling power of the air during expansion. By the help of the diagrams, Mr. Kirk then explained the arrangements by which this was carried out. He concluded by saying that the advantages attending the use of his machine were, that no expensive or dangerous fluid was employed, involving risk of fire of suffocation to the attendants; that the cooling power might be reduced to any extent when required, the consumption of motive power being similarly reduced; and that cupped leather packings might be employed, which gave so little trouble, that in the first machine one worked for four months without being touched. Mr. Kirk then, at the request of the meeting, gave some explanations of parts of his machine which had not been understood, and those explanations appeared to fully satisfy the meeting of the practical utility of the machine. He further stated that the cost of the machine, without boilers, was £700.

Professor Miller said he was glad to hear that the machine had been practically successful. The inventor had employed a new principle in a new, simple, and effective manner.

Mr. Young said he was able to say that the machine was all that was ever expected. Former machines they had used always kept them in a state of bodily terror, and once they had a slight fire; but by using this new machine there was no longer any cause for fear. The machine was an extraordinary success. It went on day and night, without intermission and without trouble. With one tun of coal, costing 4s., they could produce one tun of ice. He was glad to be able to give his testimony to the perfect working of the machine (applause). All manufacturers must hail such a chemical invention.

Professor Miller—Has it the effect of the ether machine?

Mr. Young—It has just the same effect as the old ether machine, without the loss of ether (applause).

NEW WAY TO SEND A "CIPHER" MESSAGE.—Wrap a strip of paper slanting around a pencil case, ruler, or any round object, making all the edges meet. Write upon it, and then unwrap it; it will be quite a chaos, but when brought back to its old position on the roller, it will be as legible as this print. The roller would have to be the same in both cases, with the sender and recipient, but this could easily be arranged beforehand. The message might also be written zig-zag on the roller, and thus increase the difficulty of reading it.

FOREIGN INTELLIGENCE.

SUGAR AND CORPULENCE.—Alderman Mechi writes, "I can confirm personally Mr. Banting's statement that sugar produces corpulency. Some time before that gentleman published his case, I found myself getting too 'aldermanic,' in spite of severe exercise. Hearing casually that a very stout lady had diminished to genteel proportions by leaving off sugar in her tea and coffee, I followed her example, and found that I had lost fourteen pounds weight in six weeks —very much to my comfort. The quantity of sugar I usually consumed was under one ounce and a half daily. As I much prefer my tea and coffee sweetened, I again ventured moderately, and soon gained seven pounds; so now I regulate my weight principally by the use or discontinuance of sugar. The ready solubility of this saccharine matter permits it to be absorbed immediately by the system. I hope that my agricultural friends who wish to farm profitably by the rapid fattening of their cattle and other live stock will take the hint. The scarcity of roots this season will render the use of treacle, sugar pods, linseed and other saccharine and oleaginous substances absolutely necessary, mixed with straw, chaff or bulky substances."

CAST STEEL IN BOILERS.—The employment of cast steel is every day extending, and often with advantage. In 1859 Herr Kohn, a German engineer, placed in a boiler 40 feet in length, made of plates 11 millimetres thick, a sheet of steel only 5½ millimetres thick. This sheet, which was placed near the furnace, was found, after two years and a half of very sustained work, in a perfect state of preservation, while the neighboring sheets of iron plates had suffered greatly. The steel plate bore, besides, no incrustation, a result which was attributed to the more rapid action of the water on coming in contact with it. Experiments made in this direction have not, however, always proved successful. Thus the Austrian railway company had six locomotives made with boilers of cast steel. The working of these engines was not satisfactory, the fire boxes displaying alarming rents after a short time. The Austrian railway company is, however, determined to persevere with further experiments.

HAY AND HONEY.—It is a common saying that a year in which hay is abundant proves a good one for honey. The present one cannot be called a good year for either hay or grass, but few will deny its goodness for producing honey. The warm weather about the middle of May caused many bees to swarm at that early day, and we have heard of several of those swarms producing 40 lbs. of honey. Those which swarmed at a later period also did well, gaining as much as two pounds a day during the fine days of July. This season has been the best one for honey since the year 1859.

ANOTHER NEW ENGLISH STEAM ENGINE.—A new steam engine has been invented by Messrs. Martin & Hodgson, of Manchester, England, which has two pistons in each cylinder on a vibrating shaft, just as a door swings on its hinges. Motion is communicated from the cylinder shaft to the screw shaft by means of levers and connecting rods. This engine, or its principle, was designed by Captain Ericsson many years ago. The *Princeton* frigate had two, and drawings of them can be found in "Stuart's Naval and Mail Steamers of the United States."

THERE are five evening papers issued in London, but before the month has passed another will be added to the number. The *Glow Worm* will be published some hours later than the usual time for issuing the *Evening Standard*. It will contain the latest news from the city, the Houses of Parliament, and the race-course. It will be sold for one penny.

GREASED STEAM.—An advertiser in a foreign mechanical journal makes use of the following language in puffing a new oil cup:—

"The above Lubricators grease every particle of steam previous to its passing through the valves into the cylinders."

We have heard of greased lightning, but greased steam is a decided novelty.

PATENT-LEATHER belts are used in England for out-door work. They are said to be impervious to damp and retain their length in all weather.

Correspondence

Pitches of Screw Threads.

MESSRS. EDITORS:—Referring to the remarks of your correspondent, P. T. Kissane, in No. 16, current volume of the SCIENTIFIC AMERICAN, on the subject of screw threads, allow me to say that I am on a committee, with nine others, appointed by the Franklin Institute some months since, to take up the subject of a uniform system of sizes of bolt heads, nuts and screw threads. We have held several meetings on the subject, in which we have discussed the importance of an uniform system, also the imperfections of all present systems, if indeed they can be called such, and we will very soon submit a complete scale of pitches and form of threads, such as we can recommend for general adoption by the American mechanics.

Our discussions thus far seem to convince the majority of us that the general practice in this country and England has been to make the pitches of our screw threads too coarse; that what is known as the "Whitworth standard," which is in general use in this country, is unnecessarily coarse for any common bolt work. We deem it a very important subject and would like to have an expression of opinion from all good *practical* mechanics.

Any communications giving light on the subject addressed to the "Committee on Screw Threads, Franklin Institute, Philadelphia," or to my address, shall have consideration at the hands of the committee. WM. B. BEMENT,

Chairman of Committee on Screw Threads, Franklin Institute, Philadelphia.

[We take great pleasure in publishing this communication because there seems to be a prospect of arriving at some solution of the very general dissatisfaction on the subject of varying pitches for screw threads. For years we have been agitating this point in the SCIENTIFIC AMERICAN. Our correspondent, Mr. Bement, has underscored the word "practical," mechanics, but in spite of this we shall offer some suggestions to the Committee which may be of some value as coming from one who has been, but is not now, a "practical mechanic." We hope that in discarding the "Whitworth standard" *fractional parts of uneven threads* will have no part in the new arrangement. No man can count them in short lengths; few lathes or trains of gears can cut them, and in every sense of the word they are a vexation. What can be worse than 15¾ threads in two inches or 9½ threads in seven-eighths of an inch, or similar absurdities. There is one other point, too, which may be worth considering, and that is the nature of the metal the thread is used on. Cast iron being by nature crystalline, should have a finer thread than wrought iron, brass work has always finer threads than wrought iron. These three are the metals most in use. No machinist makes a thread more than three-fourths full in cast iron because all beyond that weakens it by tending to break off the sharp edge. Very many mechanics in small practice could not afford to have two sets of taps; or three, for all have two sets - one for brass and one for iron—and this would tend to confuse the subject perhaps more than it would aid it. Regarding the bolt heads and nuts, the matter is more difficult to set at rest. If a blacksmith in a small place had not iron large enough to make the heads or the nuts, the machinist would have to take the best he could get, or else delay his job, and perhaps lose his money. Fine threads are as apt to be overrun as heavy or coarse pitches are to detract from the strength of the bolt, but we presume the Committee have taken these points into consideration and will give them all the reflection they deserve.—EDS.

Food for Gold-fishes.

MESSRS. EDITORS:—I have read your note concerning gold-fish in a recent number of your journal, and think I am able to answer it satisfactorily as I have always had much to do with these fishes in Europe and this country.

Gold-fish require food, though very little. The best is to take a *white* wafer of small size every two or three days, grind it to powder and throw it into the basin. This will be plenty for five or six fishes. A great deal of care ought to be taken not to give more, as it may kill the fish, by their eating too much of it. W. C.

New York, Oct. 13, 1864.

White wafers are made of flour and water.—EDS.

Hams Cured with Dry Sugar.

A correspondent sends us the following interesting advice on this subject:—

"The meat must not be allowed to freeze under any circumstance—freezing destroying the property in the juices, which prevents any application of sugar, molasses or salt from uniting with them and forming the chemical combination which keeps them from souring. Separate the right and left hams; spread them on a floor, shelf or in a box, the thick part of each ham overlapping the thick part with the butts elevated three inches more than the shanks. Bearing in mind, through the whole process, that the retention of the juices by placing the hams in a proper position and free from any kind of pressure is essential.

"To cure a ham of fifteen lbs. weight requires one lb. of good brown sugar. two oz. refined and ground saltpetre, half a pound ground sea salt. First application—saltpetre, and cover the face of the ham with sugar a quarter of an inch thick; on the fifth day rub the skin side with sugar. Second application—saltpetre and a mixture of three parts sugar and one part salt; on the seventh day rub as before. Third application—half sugar and half salt; in 7 days rub as before. Fourth application—same as last; in seven days rub with half sugar and salt; clean the flesh side of the ham. Fifth application—very good molasses (not sorghum) as long as the meat will absorb it. Saturate the ham with sugar as you would in preserving fruit; the salt is only to flavor it; for hams intended for boiling, and which require more salt, you may use salt according to your judgment and give more time. The ham is now cured, and for purposes of broiling it will be found delicious.

"Hams should always be dried without smoke, hanging them in domestic sacks, shank down. If you prefer smoke, hang for two months, and then commence smoking, observing to have your meat elevated as many feet from your fires as practicable. Smoke-houses should be constructed so that the smoke is admitted at the top of the building; the meat being near a dry floor, the smoke settles on the meat after being cooled. Hot smoke should never touch meat. Smoke very slowly, using green hickory smothered with green sawdust from white or burr oak timber, if you can get it. I have never used any thing else, and therefore cannot speak of the merits of corn cobs or sassafras; but as a rule use timber that smokes *red*, not *black*; during the last six hours smoking throw red peppers on the fire, it keeps off the "skipper bug." You may want to know what are the advantages gained by curing hams by this expensive process. Well, they are weight and superior quality; as to their keeping I never had a chance to ascertain it—hams cured in this way being "gobbled up" immediately when placed in market—their keeping qualities don't get a chance to be tested. Compared with a sweet pickled ham there is just the same superiority in quality as there is between the sweet pickled and salted. Try a few.

"One word more about the special advantage of curing with sugar; fat cured with salt is repulsive to weak stomachs, consequently a large portion is trimmed off hams intended for the American market that in England is always retained, for two reasons—economy and preserving the juices. Stomachs that reject fat when salted, find it palatable and delicious when cured with sugar. J. T. D.

"Springfield, Ill., Oct. 3, 1864."

A Rolling Wheel and Flying.

MESSRS. EDITORS:—In your paper of Oct. 15, I saw two questions propounded both of which are founded on error. It is manifestly impossible that any point in the wheel should go "through a series of changes in velocity during each revolution, for that would imply that each one of any circle of points equidistant from the center was moving with a different velocity; and the points of the circumference, for example, would be continually approaching and receding from each other, or from the center. Each point of the circumference of a circle generates, as it rolls over a plane, a cycloid, as is well known. But every part of a cycloid is generated with equal velocity for in proportion as the horizontal component diminishes the vertical increases, and thus the velocity remains constant. In the case of a wheel brought to rest, inertia tends to compress the particles of the periphery, in front of the point of contact with the ground and to separate those behind. The reverse occurs when the wheel is started from a state of rest, but during uniform motion there are no tendencies of this kind.

If it is admissible to speak on two subjects I would like, while I have the floor to make a remark in regard to the sensible article on flying machines which appeared in the same number. Those visionary and unmechanical gentlemen who have from time to time proposed various wing contrivances to be operated by the legs and arms, seem to have forgotten that it requires the same amount of power to raise a man 100 feet by flapping as it does by any other means. Flying is only climbing up into the air with wings, then holding on there and sliding along. But the aforesaid climbing up and holding on is the worst part of it, for air is rather an unsubstantial support, and it will not do to stop and rest; on the whole, getting up into it is harder than going up a greasy pole. A man has not the strength of a bird in proportion to his size any more than he has that of a flea, which jumps several hundred times its own length. Let any one try taking a run up the stairs of Bunker Hill monument, and when he gets to the top he can reflect, if he feels like it, that it would take the same power to fly to that hight, even if he succeeded in applying it as advantageously as nature has done it for us, to say nothing of the weight of the flying apparatus. We must resort, then, to the tireless steam engine, if no other more powerful motor be adopted. It would be necessary to make a nice calculation, based on accurate scientific principles, of the weight of the different parts in relation to the area and speed of the propelling surfaces. If then we combine an engine designed for lightness and the consumption of petroleum, one or more large screw propellers and a pair of flat, rigid wings whose inclination might be varied, we will have something which might perhaps contain some of the elements of a successful flying machine. WM. MAIN, JR.

Philadelphia, Oct. 14, 1864.

[The motion of all parts of a rolling wheel is the same in relation to the axle and to the carriage, but not in relation to the earth. The upper part is always moving the fastest along the road. Some very clear-headed mechanics are of opinion that a machine may be constructed by means of which a man can fly by the power of his own muscles, but none of them suppose that a man can raise himself 100 feet high by wings. The power required to skim along nearly horizontally is very different from that required to ascend vertically.—EDS.

Another Cone Pulley Rule.

MESSRS. EDITORS.—I saw in the columns of your paper a simple rule for obtaining the size of cone pulleys, which I think I can simplify considerably; it may be well understood, but I have not seen it in print or practice. My plan is to make one cone any size required; say, for instance, a four-cone pulley, 14, 12, 10 and 8 inches. Now suppose the smallest pulley of the next cone is 4 inches; adding that to the largest pulley of the first cone, makes 18 inches, and 6 to the next in size, making 18 inches also, and so on; like this, for example :—

14	12	10	8
4	6	8	10
18	18	18	18

The belt will run correct on either cone. Any odd or fractional part of an inch will be the same. To make a new cone to match an old one it is a quick and sure way. We frequently find cones that do not descend in gradual ratio, viz. :—

14	11	9	6
6	6	11	14
20	20	20	20

The same operation will produce the same results the belt will run equally well. H. MECHANIC.

Lanesboro', Mass., Sept. 14, 1864.

ARMOR PLATES AND ORDNANCE.

In the middle of the famous story of the guns, when every piece of practical experience was in request, we took occasion to remark upon the unfortunate imperfection of the evidence obtained from America. In that country new iron-clads were pitted against new artillery week after week, and if we could have got absolute information of the quality of the armor, and an exact account of the character and position of the guns, we could have instituted very serviceable comparisons between the British and American systems of artillery. Unluckily, however, these materials were never furnished, and the omission was the more to be regretted on account of the wide difference between the theories actually accepted in the two countries. The Dahlgren gun, which is the gun most in use in America, is constructed on the principle of preferring weight to velocity. It projects, with comparatively small velocity, exceedingly heavy balls, whereas the ordnance approved in this country possessed greater penetrative power, but carried, until recently, lighter projectiles. We were repeatedly assured by certain parties to the controversy that the Americans were ahead of us in these matters, and the action between the *Kearsarge* and the *Alabama*, in which the former destroyed her adversary with her 150-pounder Dahlgrens. was appealed to as almost decisive of the question. But we have now attained he one thing that was formerly wanting—a trial of this ordnance under known conditions and on a large scale. A strong iron-clad ship, the construction and armament of which are exactly known, engaged a squadron of vessels of which the armaments are known also; and this action in Mobile Bay, now illustrated not only by a Confederate version of the story, but by a special report upon the condition of the captured iron-clad, will enable us to measure with the requisite accuracy the relative efficiency of American artillery. We will first describe with precision the conditions of the trial—that is to say, the strength of the target or armor-plating on one side, and the number and the caliber of the guns on the other.

The *Tennessee* was a fine steam-propelled iron-clad ram, 200 feet in length, and 48 feet 6 inches in breadth. She carried 6-inch and 7-inch rifled guns; but of her aggressive powers we need not speak, as we are concerned at present with her powers of resistance only. Her defences, then, consisted of a wooden framework some 23-inch thick in the aggregate, and covered with five, or, over certain portions, with six inches of armor. This armor was composed of plates—or, as we should rather term them, bars—of iron, about 6 inches in width, and varying in thickness from two inches to one. Three layers of the thicker bars gave 6 inches of ironwork; two of these and one of the thinner gave 5 inches. It is said that at certain points of the greatest exposure the wooden backing received an additional thickness; but, at any rate, in its strongest part the armor of the *Tennessee* consisted of some 30 inches of wood, and 6 inches of iron, and no more. Now, when we recollect that this iron-plating was not solid throughout, but formed by successive layers, and that the whole fabric must necessarily have been constructed under many disadvantages, we may very confidently conclude that the target presented by the sides of the *Tennessee* to the Federal guns was certainly not stronger than those which have been employed in our experiments at Shoeburyness. It is hardly credible that the Confederates could have procured iron of such a quality as our own fastidiousness demands, and we have long ago assumed it as unquestionable that laminated armor is far inferior to solid plating. We should observe that the casements of the *Tennessee* were inclined at an angle of 45 degrees, but that condition, as far as our trials have taught us, would not materially affect the issue. Such, then, was the target; no stronger, to say the least, than those used by ourselves. Let us now see what was the strength of the artillery brought against us.

Admiral Farragut took into action fourteen wooden men-of-war and four monitors, and with seventeen of these vessels he engaged the *Tennessee* alone for upwards of an hour, one of his monitors having been blown to pieces by a torpedo, and the small gunboats of the Confederates being quickly dispersed. This squadron carried altogether nearly 200 guns, of the best quality and largest calibre known to the American service. In the broadsides of the sloops there were eighteen 100 pounder Parrott guns and 126 9-inch Dahlgrens. In the turrets of the four monitors there were six 11-inch and four 15-inch Dahlgrens, the latter throwing a shot of 450 pounds weight. In the gunboats there were no pieces smaller than 100 pounder Parrotts and 11-inch or 9-inch Dahlgrens. It thus appears that every variety of American ordnance was here represented, and that the most powerful guns used in the Federal service were employed in the engagement. To show also the completeness of the experiment, we may add that the *Tennessee* was pounded as fairly and as deliberately as any actual target in artillery practice—in fact, under conditions to which no target in a real experiment would ever have been exposed. The batteries of the Federal vessels were brought to bear upon her at a range, not of 200 yards, but of ten feet, and towards the close of the action she became so far disabled by an injury to her rudder chains that the attacking vessels could choose their own positions and cannonade her with perfect impunity.

Now, what should we have thought, on the face of the case, would be the result of such an engagement? We should have concluded, beyond all question, that the *Tennessee* would have been sent to the bottom in ten minutes; that she could never resist such pounding from such batteries; and that a far smaller number of guns, of less caliber, would have been sufficient to dispose of her under such conditions. In fact, if the first broadside of 9-inch solid shot delivered from the Federal flagship at ten feet distance had sunk her on the spot we should not have been much surprised. But at what did really happen we are surprised in the extreme. All this prodigious array of artillery, these monstrous cannon, and these ponderous balls, proved practically ineffective against the wood and iron of the *Tennessee*. The target beat the guns hollow. The heavy Dahlgrens simply produced indentations on the iron bars of the ram.

The Parrott guns did no better. Solid shot from the sloops, steel shot from the rifled pieces of the gunboats, and shells from the monitors were poured upon the target at close quarters, for an hour together, without producing much more effect than so many pistol bullets. We are especially told that the gunnery practice was excellent, that the Federal sailors never lost a chance, and that they planted their shots just where they were most likely to tell. But we also know, and from Federal as well as Confederate sources, that the *Tennessee* proved practically impregnable through all this storm of projectiles. It is admitted that the ship when finally captured, under circumstances which we have already related, was substantially uninjured. One 450 lb. ball had pierced the armor, and started a portion of the wooden backing, but had not actually entered the ship, and that was the nearest approach to penetration.

We must now invite the public to draw a conclusion from this extraordinary trial. Of two things—either the armor of the *Tennessee* was superior to any of the targets which represent our iron-clads, or the ordnance of the Federals is inferior to our artillery. We have already said that we do not think the former hypothesis could be maintained for a moment; and, consequently, we must close with the latter. This we do without hesitation, and we imagine that most persons acquainted with the subject would be prepared to affirm that the guns which penetrated the *Warrior* target would, at 10 feet distance, have smashed in the sides of the *Tennessee* before the action had lasted a quarter of an hour.—*London Times.*

A New Great Gun.

The London *Times* makes the following announcement of a new invention of heavy ordnance:—

"A gun, we believe of entirely novel construction, has been invented and patented by Major-General Hutchinson, commanding in the west of England, and if the expectations of the inventor be only partially realized, great changes will take place in the construction of much of our ordnance. The objects sought to be accomplished in the new gun are—first, that it shall weigh little more than twenty times instead of upwards of eight hundred times the weight of the shot, as is usual; second, that without friction it shall impart rapid rotation to the shot; third, that the shot shall be of the form best adapted for penetrating the air and target; and, lastly, that it shall leave no vacuum behind it, and not ricochet when it strikes the water. A few experiments have been made at Plymouth. The last took place on the 28th ultimo, on board the gunner-ship *Cambridge*, Capt. J. F. Ewart, in Hamoaze.

"The gun is somewhat like a lengthened mortar. The chamber is of the usual cylindrical form, but only sufficiently long to hold the powder and wadding. It is at the mouth that the chief peculiarity occurs. The shot is termed disc shot. Those used last week were about the size of two very small plates placed against each other, excepting that the edge is sharp. The muzzle of the gun is much enlarged, and is formed so as to receive with great exactness the inner half of the disc shot. The more accurate the fitting is the less the escape of gas and the truer the aim that can be taken. When in place the outer edge of the shot is flush with the muzzle of the gun. The shots weighed 4 lb. 2 oz. The charge of powder, 6 oz., being 1-11th part of the weight of the shot, whereas the usual proportion is about one fourth the weight of the shot. The gun was of nearly 200 lbs. weight, double, the inventor said, what it ought to have been. The first trial was at the 1,000 yards' target. The shot went in a good direction, and pitched 100 yards beyond the mark. The other two experiments were at 13 degrees elevation for range, and 4 degrees for aim. In neither case could the position of the shot, when they fell, be observed. The tide was out, and doubtless on striking they, from their rotation, buried themselves in the mud.

"The experiments, as far as they went, were considered satisfactory. When in the gun the shot stands in a vertical position, and rotation is causedf by the axis of the chamber lying above the center of the shot, and by a small projection in the interior of the muzzle, at the bottom, meeting the edge of the shot. From the shortness of the gun it possesses all the advantages of a breech-loader, and from the simplicity of its construction and the little metal used it promises to be both a cheap and easily-handled weapon. The projector may be too sanguine, but he avers that one weighing no more than the ordinary 66-pounder will discharge a 600 lbs. disc. The carriage is fitted with a number of galvanized india-rubber cylindrical buffers (in contact by their sides, not extremities) placed in grooves on the flanks of the gun; these received the recoil. By a simple mechanical arrangement the rebound was received in a similar manner on a series of rings fixed below the gun. This disposition of india-rubber rings the inventor prefers to any compressors, as they do not make the gun 'jump,' to use the technical expression."

[This is another exhibition of the London *Times's* mechanical science. If the writer had opened any ordnance manual he would have found that the usual proportion of the weight of the gun to that of the shot is 100 times, instead of 800. This proportion is fixed by the first law of mechanics, "action and reaction are equal." If Major-General Hutchinson tries a gun only 20 times as heavy as the shot, he had better not stand behind it when it is discharged.

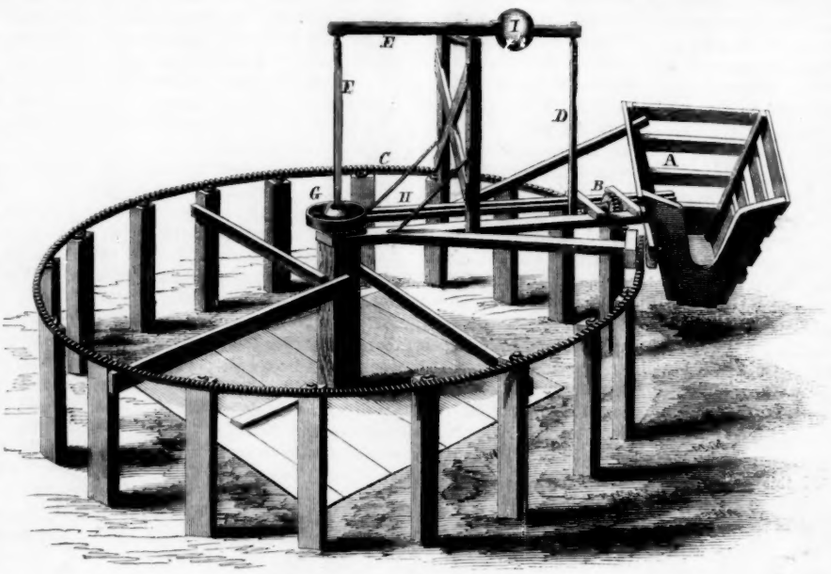
The idea of a disc shot to be fired in this way is certainly novel, but as the first movement of the shot would open a free passage for the escape of the gases, the pressure could be but momentary, and no considerable velocity could be obtained. In firing "at 13 degrees elevation for range, and 4 degrees for aim," it was a shrewd plan to fire into the mud, so that it could not be seen where the shot struck; then the experiments could be pronounced by the great "Thunderer" satisfactory.—EDS.

A 13-INCH PLATE.—Messrs. John Brown & Co., of the Atlas Works, Sheffield, have succeeded in rolling an iron plate, six feet by seven feet, and thirteen and a half inches thick. The idea of manufacturing so enormous a plate originated, we believe, with Captain Inglis, of the Royal Engineers, with a view of ascertaining if it would be desirable to protect casemates with such a powerful covering. The plate has been forwarded to Shoeburyness, where it will be exposed to a very trying test.

THE English 13½-inch gun costs $20,000. Four of them are now making at Elswick.

Improved Cattle Pump.

The inventor of this pump has started on a good principle. Instead of making man subservient to the beast, the beast is made to wait upon himself, and, like the trained canary birds in cages, draw its own water as it is required. In many places water for stock can only be had by pumping it from wells, and in such localities the arrangement herewith illustrated would be an extremely useful one. The machine is not at all complicated and is adapted to the comprehension or operation of the most stupid ox, the said ox having merely to travel round in a circle as a tread-mill is worked. The beast—horse, cow or any other animal—puts its head into the yoke-box, A. It then travels round, pushing the box before it. This act causes the pinion, B, to revolve in the circular rack, C. On the end of the pinion shaft is a crank which connects to a rod, D, which in turn works the pump brake, E, and plunger rod, F. The water thus raised falls into a cast-iron dish, G, and from thence runs down the trough, H, which moves when the box does, and conveys the water to the animal, so that when it has pumped enough to supply its wants it ceases and goes away, not being willing, doubtless to pump water for its comrades. In this way no water is wasted and no labor other than of the animal is required. The ball, I, is intended as a counterbalance to the column of water raised when the well is deep. There is no difficulty in teaching animals to draw their own water in this way; in a short time they will go to it as naturally as they do to the stack for fodder.



DICKSON'S CATTLE PUMP.

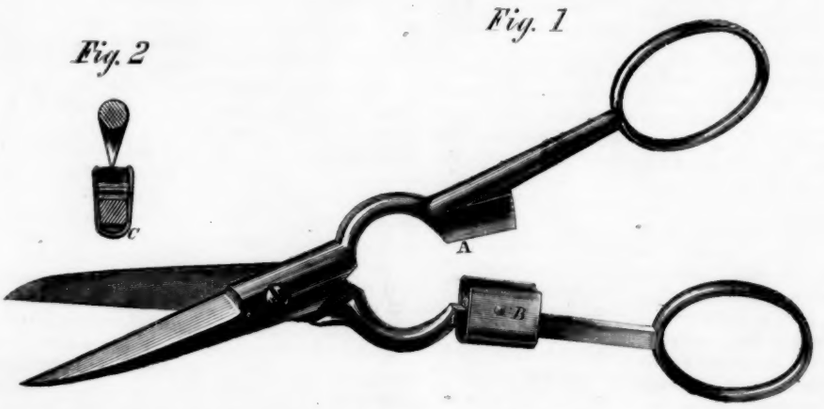
Patented through the Scientific American Patent Agency, by Jos. A. Dickson, of Sandwich, Ill., on the 20th of Sept,. 1864. For further information address him at that place.

Improved Button-hole Cutter.

This attachment to a pair of scissors is intended principally for cutting button-hole slits, for which purpose it will be found very convenient. It can also be employed for snipping off thread, or the miscellaneous uses which seamstresses or tailors, have for such an instrument. The invention consists in forming a cutting blade, A, on the shank of one leg of the scissors and affixing a bed, B, which has a surface of raw-hide, vulcanized rubber, wood, or any tough resisting material, to the other shank, so that it can be moved up and down. This bed is held in place, when used, by a spring, C, inside (see Fig. 2), but which yields when pressure is applied to the end so as to slide it up and down. In other respects these scissors are not peculiar. This is a very useful article, and one that will save much time in handling other tools generally used to effect the same object. It was patented Oct. 4, 1864, by Francis G. Sanborn, of Andover, Mass. For further information address the inventor as above.

Fig. 1

Fig. 2



SANBORN'S BUTTON-HOLE CUTTER.

Improved Mining Machinery.

It is proposed in England to dispense with ropes and chains in mining machinery and to use the pneumatic elevator. A cylinder or tube is placed in the shaft, which rises a few feet above the top, and reaches a few feet below the bottom of the mine. In this cylinder or tube a double-headed piston works, and between the two heads of the piston a fixed or movable receiver or barrel, or wagon is placed, which holds the mineral or water to be raised. An air-pump, worked by steam engine or water-wheel, or other power, is used for forcing air down the shaft in a tube, which air passes into the cylinder below the under piston-head. When the load is put in at the bottom, a valve is opened, so that the air is introduced under the piston, which with its load, then rises to the top. On arriving at the top the load is removed, and on an escape-valve at the bottom being opened, the piston descends, and the air which escapes ventilates the mine.

English and Swedish Iron.

The difference between plate iron made respectively in England, France, and Sweden, has been thoroughly tested at the fortress of Calberg, Sweden. There were two French plates, each 7 feet 6 inches by 2 feet 3 inches, and one 6 feet by 3 feet 8 inches. All the plates were 4½ inches thick, and then bolted to a teak target backed with iron plating, and supported by a massive stone pier. The two upper plates in the target were French, each secured by 11 bolts; the next plate below was the longest, Swedish, secured by 29 bolts. Below this was a tier of two short plates, one Swedish and one English, each secured by 24 bolts, and the lowest plate was a long English, secured by 29 bolts. Each plate received six shots from the ordinary 68-pounder naval gun. The French and Swedish plates broke to pieces, and the English plates remained uninjured and free from cracks. The shots used were of Swedish iron.

Terrible Tornado in Illinois.

A correspondent of the Chicago *Tribune*, writing from Mattoon, Ill., Sept. 24, says:—"A terrific tornado passed over this section of the State yesterday, at about five o'clock, P. M. Its approach was heralded by a dense black cloud rising rapidly in the west, and rushing with fearful velocity over the prairie nearly due east, accompanied by tremendous discharges of electricity, which fairly shook the earth like an earthquake. It struck the Central Railroad track at Mattoon, unroofing and blowing down buildings and carrying away every movable thing in its path, but most fortunately and incomprehensibly inflicting no serious injury upon any one. A loaded freight train on the Illinois Central Railroad, going north, was lifted bodily and turned over beside and across the track. Some of the cars were smashed to splinters, while others were merely unroofed and the freight little injured. One car was carried half a mile. Bales of cotton, hogsheads of tobacco, barrels of flour and fragments of the cars were strewn over a large extent on either side of the track. The clearing of the ruins occupied the whole night, and the trains were detained. Singularly no one was hurt on this train, which was so completely demolished. This section of the State has always been subject to these terrible visitations. It is a vast expanse of prairie, presenting no resistance to the circumlocutive force of the atmosphere in motion. It will always be subject to such accidents till the prairies are planted with forests—a measure alike conducive to safety, beauty, and the material interests of the country."

Omelet.

Beat together four eggs and one cup of sweet milk. Have ready a skillet with a piece of butter the size of a walnut on a moderate fire. When the eggs are beaten, place them in a skillet and cook ten or fifteen minutes. [A capital addition to the above is par-boiled ham cut into small bits and mixed with the omelet when placed in the skillet.]—*American Agriculturist.*

[This mixture may not inappropriately be called egg leather, for cooked in this way it cannot fail to be tough, flabby, and indigestible. The proper way to make an omelet is to take three teaspoonsful of milk for each egg, and a pinch of salt to each one also. Beat the eggs lightly for three or four minutes, and pour them into a hot pan in which a piece of butter the size of a walnut has been melted a moment before. The mass will begin to bubble and rise in flakes immediately, and the bottom mast be lifted incessantly with a clean knife so that the softer parts run in. An omelet should be cooked about three or four minutes, and made in this way will melt in the mouth.—Eds.

California Silk.—It is said that the silk grown in California is even better than European, the fertility of the soil and the dryness of the atmosphere favoring the growth of the mulberry, and giving a more delicate quality to the fabric.

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VOL. XI. NO. 18....[NEW SERIES.]....*Twentieth Year.*

NEW YORK, SATURDAY, OCTOBER 29, 1864.

Contents:

(Illustrations are indicated by an asterisk.)

"BURNING" IRON CASTINGS.

The process known as "burning" iron castings together has long been practiced by mechanics. It often occurs that the too rapid cooling of one part of a casting causes an unequal shrinking of the mass, so that a tremendous strain is brought upon the weak parts. Corners of square surface-condensers, the inside angles of pillow blocks, cast in screw engine frames, the "gothic" arrangements sometimes perpetrated on the frames of land and marine engines are liable to the contingency specified.

The loss of an entire casting from the cause mentioned, many hundred dollars in value, may be and has been prevented by "burning." The process consists merely in pouring melted iron on to the fractured parts, placed in a mold or otherwise, as desired. When they attain the same heat as the liquid metal fusion occurs at the points attacked, and the metal continues increasing in size until the operation is discontinued. Of course, a shapeless excrescence is formed outside, but this is readily trimmed off. Although not as sound as the body metal, it is still very strong.

We have seen hangers for shafting and spur-gear bearings mended in this way, and they afterward broke in an entirely new place; where the sound iron was.

An account of mending heavy cast-iron rolls for rolling mills by this process is thus described by a French work—the *Annales des Mines*—which says:—

"Meugy witnessed the reparation of a roll, of which a neck and one groove had been broken off in rolling. The roll was fixed vertically, with the broken end uppermost; and around this was a coke fire in a square grate containing about 100 kil. (about 2 cwts.) of coke. This preparatory heating lasted 1½ hour. At a given moment the grate was removed, the fuel quickly thrown upon the ground, and extinguished with water. The top of the roll being now red-hot, haste was made to surround it with a frame, which was rapidly and completely filled up with casting sand. After having levelled the sand and blown off the dirt from the end to be soldered, with a pair of bellows, a mold previously ready, and having within a cavity of the form of a sort of double truncated cone, of which the base was a little larger in diameter than that of the piece to be added, was placed on the top. In this mold was a tap or exit-hole, corresponding to an external groove leading to channels destined to receive the excess of pig-iron. By means of a crane a large pot, containing about 500 kil. or 600 kil. of molten pig-iron, was raised a little above the mold, and the metal poured in Scintillation occurred round the mold, and the pig-iron filled the external channels, where it solidified in the form of pigs. The head workman, who directed the operation, and who sounded every moment the surface of the piece to be soldered with an iron rod, ascertained when the surface of the roll began to melt; and when he thus found that the old pig-iron had liquefied to the thickness of about 0m03 (1·18 in.), which happened in four or five minutes, after pouring from 300 kil. to 400 kil. of pig-iron, he judged that it was time to stop the running of the metal from the mold. The tap hole was then stopped, and pig-iron allowed to flow in until the mold became filled. This done, a second mold, containing within a cylindrical cavity representing the neck of the roll, was placed, by means of a crane, on the other mold, the frame of both exactly fitting together in the usual manner. The joints being luted with a little clay, metal was poured afresh into the uppermost mold. At last a third mold, also cylindrical, was adjusted, and pig-iron poured in, which formed a dead-head subsequently to be removed. This head, by its pressure, consolidated the soldered joint by binding more intimately the new with the old pig-iron. It then only remained to allow the whole to cool, and, when cold, to turn the part in a soldered lathe.

The process should be rapidly performed, and ought not to last longer than a quarter of an hour, exclusive of the time needed for the preparatory heating in the coke fire. According to Meugy, a finished roll weighing 1,100 kil., cost 616f.; but, as old pig-iron was only worth 132f. the cost of reparation by this process amounted to 115·8f., so that there was a clear gain of 168f."

BREECH-LOADERS AT LAST.

A portion of our armies is to be supplied with breech-loading rifles at once, or at least as soon as the weapons can be manufactured. The Burnside Rifle Co., of Providence, R. I., have contracted to furnish 35,000 breech-loaders, of the Spencer pattern, and are now making extensive alterations of their works for the purpose of delivering them as soon as possible.

From the well-known efficiency of these weapons, and of good breech-loading small arms in general, we may look for excellent results. Although breech-loading artillery has never proved itself of much value small arms on the same principle have repeatedly given proof of their utility, and their story is well told by the terse telegraphic reports of correspondents, who give regiments armed with breech-loading weapons the credit of repulsing twice their numbers when assaulted, or of putting them to flight when acting on the offensive.

This action on the part of the Government in making this contract is highly commendable, but had it occurred earlier in the war we should have been spared many disasters.

The English Government has taken a contrary course. Recognizing the efficiency of the breech-loading principle it has issued orders, through Lord De Grey, for proposals to alter the Enfield rifle into a breech-loading weapon, at an expense not to exceed $5 per gun. The Enfield rifle is the Springfield rifled musket we use, and the result will probably be to spoil both weapons—to ruin a good rifle and make a poor breech-loader. Our Government has taken the wisest course and are on the safe side, for the record of the Spencer rifle is already made, and, not to perpetrate a witticism, will now be repeated.

CONDENSATION OF STEAM IN LONG PIPES.

Some information, exceedingly interesting to engineers, has recently been made public in an account of a subterranean engine erected in the celebrated "Gould and Curry" mine, California. The engine is 50 horse-power, and is 201 feet below the surface of the ground. The article is extracted from a journal published in the vicinity of the mine, and can be found in another part of this number. Those interested will note the amount of the loss of pressure from condensation in the two steam pipes mentioned therein. Where the Gould and Curry pipe was packed with ashes it lost but five pounds in going 1,100 feet; whereas in the straw-jacketed pipe, at the New Almaden mines, the steam lost 14 pounds in going only 1,300 feet.

There would seem to be a much greater gain from preventing radiation by packing the ashes loosely around the pipe. Dr. William Charles Wells in his work on "Dew," states that it is first apparent on wool, and similar filamentous substances. From this we might argue that the heat from the earth is cut off from them; that they remain cold, and are consequently good non-conductors.

The greatest neglect is apparent in carrying steam pipes to a distance. In many cases they are not even covered with canvass, but are exposed to all sorts of atmospheric influences. Such practices are deliberate and wilful extravagances, for which there is no excuse whatever.

THE LONDON "TIMES" ON THE TENNESSEE.

On another page will be found an article on the battle in Mobile Bay from the London *Times*. It is marked by the sonorous pomp characteristic of that paper, ludicrously contrasted with an inaccuracy of statement perhaps not less characteristic. The "Thunderer" gravely informs its readers that the inclination of the *Tennessee's* armor plates at an angle of 45 degrees would not materially affect their power of resisting the impact of shot, and that this surprising fact has been proved by the English experiments in gunnery.

We place very great value on experiments, but if it is stated that two and two make five, or that somebody has measured the three angles of a triangle and found that they are not equal to two right angles, we should refuse to believe the statement, even if made on a great deal better authority than that of the London *Times*.

Some respectable engineers have doubted whether inclined armor offered any greater resistance than the same aggregate weight in a vertical position. Even if this view is correct, 6 inches at an angle of 45 degrees would be equivalent to 8½ inches in a vertical position. Has the *Times* any record of an 8½-inch target, made up even of 2-inch plates, having been penetrated by cannon shot?

But against spherical shot there is no doubt that the inclination of the armor increases the power of resistance in a ratio much greater than that of the increase of weight. In his "Notes on Sea-Coast Defence," published in 1861, Major Barnard advocates the use of 15-inch guns, but admits that against armor inclined at an angle of 45 degrees their penetrating power would be lost. After proving by a geometric demonstration of the decomposition of the force that the penetrating power would be just half, and that this would be still further diminished by distribution, he says:—"In short, with an angle of incidence of 45 degrees the power of penetration of the ball would be wholly lost; that of smashing the bulwark reduced to considerably below one-half. If, therefore, we throw at these inclined sides a projectile of such magnitude that its living force is more than double—say four times—that which experience shows to be sufficient to break down a vertical bulwark, we may expect to accomplish the object."

It will be perceived that the whole argument of the *Times* rests on this absurd position, that the inclination of the armor of the *Tennessee* had no material effect in increasing the power of resistance.

CONDENSED MILK.

Most of our city readers have seen this article retailed from carts at their doors. In appearance it is a thick creamy-looking substance, of the consistency of molasses, which is afterward reduced to suitable thinness by the addition of water. The advantages derived from condensing the milk are that it keeps sweet much longer, and is perfectly pure. This last is not the least desirable quality, for the consumer adds as much or as little water as he chooses. We have used this milk in our family in large quantities for a number of years, and find it a very great convenience as well as luxury. For coffee it is far superior to common milk, and for young children, suffering with complaints incident to them, this condensed milk is invaluable in respect of purity; swill-fed, or otherwise impure milk, is the last thing to give a sickly, teething child.

The *New York Observer* contains an account of

the process of making condensed milk at Gail Borden's factory, which is the one alluded to by us, and for which Mr. Borden obtained a patent through this office several years ago:—

"The farmers bring their milk daily; it is poured into an immense boiler, the superfluous parts driven off, and the condensation effected in a few hours. The details of the process are exceedingly curious and worth studying. Everything is conducted with such scrupulous regard to cleanliness, that the result is irreproachable. Even the large cans, in which the farmers bring their milk, are cleansed by steam before they go back. This prepared milk is sold daily in New York from door to door, as any other milk is, but its chief market is in the army, where it is a great blessing as you will readily believe.

"The same process is applied to the juice of apples, and other fruits, and meat. Coffee is condensed in the same way. Indeed any article of food may be condensed by this summary operation, be reduced in bulk, with all its nutritious qualities preserved, and packed so as to be preserved fresh any length of time. To make the little cans, holding a pound each, a tin shop is at work constantly, and the workers are women exclusively. They are chiefly American girls, from eighteen to twenty years old, and as the machinery is driven by water and steam power, they have no heavy work on hand, and the business is admirably fitted to them. They make more than a dollar a day easily, and the shop makes about 5,000 cans daily. A carpenter's shop makes the packing boxes, and so the entire work, from receiving the milk to sending it off, is done in the factory, and this stands on the edge of the railroad at the depot, so that all labor of transporting is saved. My visit to this establishment was very interesting and impressive, for I do not recollect ever seeing a factory where so much order, cleanliness, and comfort were combined in a production so purely beneficial as this. It is the perfection of the art of condensing.

"Mr. Borden can condense 12,000 quarts of milk daily at this factory, and 20,000 in another at Brewster's station on the Harlem Railroad below, and there are four or five others in operation: one at Winsted, Conn.; one at York, Pa.; one at Livermore Falls, Maine; and two in Massachusetts. They will doubtless become more and more numerous as their great advantages and profits become known."

The British Association on the Metrical System.

At the recent meeting of the British Association at Bath, in Section F (Economic Science and Statistics), Mr. James Heywood brought forward the Report of the Committee on Uniformity of Weights and Measures, which recommended—

1. That it is desirable, in the interests of science, to adopt a decimal system of weights and measures.

2. That in furtherance of this proposal it is desirable, from its scientific capabilities, to adopt the metric system.

3. That as the weights and measures of this country are gradually undergoing a process of decimalization, it would be more advantageous, instead of drifting by degrees into a heterogeneous variety of systems, to change at once to a really convenient system

4. That it be recommended to the Government, in all cases in which statistical documents issued by them relate to questions of international interest, to give the metric equivalents to English weights and measures.

5. That in communications respecting weights and measures presented to foreign countries which have adopted the metric system, equivalents in the metric system be given for the ordinary English expressions for length, capacity, bulk, and weight.

6. That it be recommended to the authors of scientific communications, in all cases where the expense or labor involved would not be too great, to give the metric equivalents of the weights and measures mentioned.

7. That the influence of the British Association would be beneficially exerted in obtaining from Paris an authorized set of metric weights and measures, to be placed in some public and frequented building in London.

8. That advantage will be derived from the recent publication of metric tables, by Mr. C. H. Dowling, C.E., in which British standard weights and measures are compared with those of the metric system. That treatises explaining the metric system, with diagrams, should be forthwith laid before the public. That works on arithmetic should contain metric tables of weights and measures, with suitable exercises on those tables; and that inspectors of schools should examine candidates for pupil-teachers in the metric system.

9. On the subject of temperature, it is recommended that the authors of reports to be presented to the British Association relative to temperature be requested to give the degrees of heat or cold according to both the Centigrade and Fahrenheit thermometers.

10. It is recommended that the scales of thermometers constructed for scientific purposes be divided both according to the Centigrade and Fahrenheit scales, and that barometric scales be divided into fractions of the meter, as well as into those of the foot and inch.

11. That a committee on uniformity of weights and measures be reappointed.

The report referred to the history of the movement in favor of metrical weights and measures, and pointed out the advantages that would result from the adoption of a uniform system. Professors Williamson, Levi, Miller, and Daubeny, Sir B. Brodie, Sir William Armstrong, the Bishop of Natal, Captain Maury, and other great authorities upon weights and measures, warmly supported the report.

Straight Edges and Flat Surfaces.

At the recent meeting of the British Association in the Mechanical Section, Mr. James Williams read a paper on the "Flexibility of Iron," from which we extract the following interesting passage:—

"It is a common saying 'rigid as a bar of iron,' and but few persons are aware how very flexible iron, as well as other metal is. Many builders in introducing cast and wrought girders, or beams to support enormous weights, are of opinion that such beams are strong enough to what they call 'bear any weight without bending,' and are much surprised to be told by a mechanician that these same girders, however stiff they may appear, will not even bear their own weight without considerable deflexion. Many good working mechanicians even are quite unaware of the extreme subtlety of the metal they are operating on. It is only that class of mechanics who are engaged in scraping up valve faces, slide lathes, and similar tools, and, above all, attempting to make 'flat surfaces' and 'straight edges,' that can comprehend in a fair way the trying difficulty of keeping such works true after they have once got them so. In the engineers' workshop, where straight bars of metal are used for the purpose of testing the work under process of manufacture, it is necessary to keep at least three bars or surfaces of each kind for the purpose of testing each other, for it has often been known that a straight edge, got up with all the care and accuracy possible, true to-day will be bent to-morrow; indeed, the very handling of it while in use is quite sufficient to distort to such a degree that the workman frequently has to put it by awhile until it comes to the natural temperature of the room he works in, the partial heat of the hands alone being sufficient to render it useless for its object. In getting up straight edges and flat surfaces, if two only are used to test each other, it is all but a certainty that one will be hollow and the other rounding, but by using three we are enabled to discover this defect."

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week; the claims may be found in the official list:—

Coffee Roaster.—This invention consists in the employment of a cylinder which rotates on friction wheels by means of flanges projecting from one or both its ends, and which is provided with a stationary feed box at one end, and with a rotary slide or other suitable gate opening at the opposite end in such a manner that the coffee can be introduced into the cylinder and discharged therefrom without stopping its motion or removing it from its bearings and that by this arrangement cylinders of much larger caliber can be used and much more work can be accomplished than by the ordinary method of hanging, changing and discharging the roasting cylinders. The interior of the cylinder is occupied by double spiral flanges, one inside the other and running in opposite directions, in such a manner that, by the action of one flange the beans are propelled towards one end, and by the action of the other flange towards the opposite end of the cylinder, and the beans are made to travel back and forth through the cylinder without reversing the motion of the same. Jabez Burns, of 269 Washington street, New York city, is the inventor.

Device for Turning-in Dead-eyes.—This invention relates to a new and useful implement for adjusting or fitting the ropes of shrouding in the grooves of dead-eyes, and which is technically termed turning-in dead-eyes. The object of the invention is to obtain a device by which the work can be accomplished with great facility and in a much more thorough way than hitherto, the ropes being fitted around the dead-eyes in a more compact and snug manner. William A. Overton, New York city, is the inventor.

Bolt-cutting Machine.—This invention consists in a ring having eccentric recesses or ways and provided with ribs to connect with the dies, said ribs and ways being made to expand in the direction in which the machine revolves in combination with a spring, stationary flange index plate and brake or friction clutch in such a manner that by applying the brake to the circumference of the ring the dies are instantly expanded, which allows of the bolt being withdrawn without stopping or reversing the machine. By changing the position of the index plate in relation to the stationary flange, the size of the opening in the dies can be adjusted to compensate for wear in the dies. J. A. Merriman, of Chicago, Ill., is the inventor.

Sugar Pan.—This invention relates to a certain improvement in that class of sugar pans in which the three compartments of the pan are separated one from the other by transverse partitions and placed at different levels so that the juice from the first compartment runs down to the second, and from the second to the third or finishing pan. Each of the two first pans is provided with a deep gutter or depression close in front of the partition separating said compartment or pan from the next succeeding one, and the opening or gates leading from one pan to the next are placed at such a hight above the bottoms of said gutters that by opening the gates the sediment is retained and the clear juice or sirup is allowed to pass from one pan to the other. In order to retain the scum each gate-opening is furnished with a movable box strainer which can be readily inserted before the gate is thrown open.—H. F. Bartlett, of La Grange, Mo., is the inventor.

SPECIAL NOTICE.

J. Stuart Gwynne, of New York City, has petitioned for the extension of a patent granted to him on Jan. 14, 1851, for an improvement in rotary pumps.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Dec. 26, 1864.

Henry Ruttan, of Coburg, C. W., has petitioned for the extension of a patent granted to him on Jan. 31, 1851, for an improvement in ventilating furnaces.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Jan. 16, 1866.

All persons interested are required to appear and show cause why said petition should not be granted. Persons opposing the extension are required to file their testimony in writing at least twenty days before the final hearing.

ISSUED FROM THE UNITED STATES PATENT-OFFICE

FOR THE WEEK ENDING OCTOBER 18, 1864.

Reported Officially for the Scientific American.

☞ Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying size of model required and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

44,698.—Evaporating Pan for Sugar.—H. F. Bartlett, La Grange, Mo.:

I claim the box shaped strainers, l, plates, i, and openings, K, arranged in combination with the pans, c d e, and gutters, f g, in the manner and for the purpose substantially as specified.

44,699.—Knife, Fork, and Pie-crimper.—George D. Bayley, Boston, Mass.:

I claim a pastry knife, fork, and pie-crimper combined, and substantially as set forth.

44,700.—Baker attached to Coal-oil Lamp.—Wm. B. Billings, New York City:

I claim, first, The employment in connection with, or as an attachment to, the burner or burners of oil or gas lamps of a heater or oven for baking and other purposes, the same consisting of a vessel divided into compartments or sections by means of partitions, the whole being arranged for operation substantially as set forth.

Second, In combination with a central flue or chimney of a coal-oil or other lamp I claim a heater oven, when divided into compartments as described, surrounding said flue or chimney, substantially as and for the purposes set forth.

Third, I claim the employment in combination with a heater or oven, divided into compartments as described, and surrounding the flue or chimney of a coal-oil or gas lamp as described, of perforated partition plates, whether stationary or removable, substantially as set forth.

Fourth. I claim the construction of the oven or heater to be used in connection with, and as attached to, a coal-oil or other lamp, in sections fitting one over the other, substantially as and for the purposes set forth.

44,701.—Sad-iron Heater.—Henry W. Bleyer, Buffalo, N. Y.:

I claim, first, In sad-iron heaters constructing the pits or receptacles, I, for the iron, by attaching removable dishes, K, to the plate or pan of the heater, so that the pits can be renewed, substantially as above described.

Second, I also claim the cover openers, A, constructed and operated substantially as above described.

Third, I further claim the combination of the pits, I, the openers, A, and the slotted covers, B, substantially as above described and shown.

[This invention consists in placing removable covered receptacles for sad-irons in a pan or stove-plate, and in causing the covers to open automatically when the sad-iron is being pushed into its receptacle.]

44,702.—Feed-water Regulator for Steam Boilers.—Richard E. Bond, Detroit, Mich.:

I claim the float, D, lever, C, and counterbalance, E, all within the boiler, in combination with the rock shaft, F, and its arms, j G, the whole arranged substantially as herein described, to operate either upon a cock or throttle or other valve by which the operation of the pump or other feeder is controlled, or with a steam whistle, or with both such cock or valve and whistle, for the purpose herein set forth.

44,703.—Pipe Wrench.—James R. Brown, Boston, Mass.:

I claim my improved pipe wrench as constructed with its claw, d, and the shank, c, thereof applied and arranged relatively to the two jaws, b b, and their combined prongs, a a, substantially in manner and so as to operate therewith as specified.

44,704.—Coffee-roaster.—Jabez Burns, New York City:

I claim, first, The employment or use of the friction wheels, b, in combination with the flanged heads of the cylinder, A, constructed and operating substantially as and for the purpose described.

Second, I claim the application of the stationary feed box, B, to the rotating cylinder, A.

Third, The double spiral flanges, h h′, extending through the interior of the cylinder, A, and running in opposite directions, substantially as and for the purpose set forth.

Fourth, The slide or gate, j, applied in combination with apertures, i, flanges, h h, and rotating cylinders, A, substantially as and for the purpose described.

44,705.—Meat and Vegetable-slicer.—Thomas Carpenter, Battle Creek, Mich.:

I claim the guide strip, D, arranged obliquely upon the slicer between the two knives, in combination therewith, substantially as and for the purpose herein specified.

44,706.—Die for making Bolts.—Wm. J. Clark, Southington, Conn.:

I claim the die herein described and represented for making bolts partly square and partly round out of round rods or bolt blocks, substantially as and for the purpose described.

44,707.—Bee Hive.—William R. Clark, Piqua, Ohio:

I claim, first, The sectional hive, a, when provided with the sloping platform, B, and secured together by the grooved clamps, A, substantially in the manner and for the purposes herein set forth.

Second, I claim the combined ventilator and shutter, F f f′, constructed in the manner described, and employed to permit air to freely circulate throughout the hive in summer and to close in the same in winter, as explained.

Third, In combination with a hive, a, and its appurtenances, constructed as herein described, I claim the sectional honey box, g, held together by the bars, G′, and having a shallow chamber, g4, between its comb supporters, g2, and the top of the hive, substantially as herein specified.

44,708.—Instrument for lighting Gas by Electricity.—Robert Cornelius, Philadelphia, Pa. Ante-dated Aug. 20, 1863:

I claim the combination of the Leyden jar and Electrophorous, substantially as above described, so as to generate electricity for the purpose of igniting gas or other inflammable materials, and for other purposes.

44,709.—Raking Attachment to Harvesters.—Hiram Curtis, New York City:

I claim, first, The elastic strap or spring, s, and loop, L, when used for the purpose set forth.

Second, I claim in combination with the endless bands or chains, B B B, rollers, R R′ and P, the elastic strap or spring, s, loop, L, coil spring, c, and cross bar, b, the whole operating substantially as set forth.

44,710.—Weed Eradicator.—George W. Davey, Groton, N. Y.:

I claim, first, The gages or guides, A A, either as adjustable or stationary in this combination.

Second, I claim the share, G, either as stationary or adjustable when applied to a suitable frame in combination with the gages or guides, A A, the whole being arranged and combined to operate as and for the purpose set forth.

44,711.—Mode of heating Stills.—H. G. Dayton, Maysville, Ky.:

I claim the annular cylinder, C, provided with steam supply pipe, b, and connecting through one or more pipes, a, with the steam jacket, B, in combination with the still, A, pipes, e g, and helm, E, constructed and operating substantially as and for the purpose set forth.

[This invention relates particularly to an improvement in apparatus for heating mash in distilleries, and the invention consists in an annular cylinder which communicates with a steam or hot air pipe, and which is situated in the center of a still surrounded by a steam jacket, in combination with a series of pipes, in such a manner that when the still is charged with mash and steam is admitted to the steam jacket and to the annular cylinder, the mash is quickly heated with a comparatively small expenditure of steam, and the surplus steam, the condensed water, the low wine, and the slop can all be discharged through appropriate channels without trouble or loss of time.]

44,712.—Apparatus for cooling Liquids.—H. G. Dayton, Maysville, Ky.:

I claim the cooler, D, composed of two crescent-shaped hollow vessels, a b, connected by serpentine pipes, c, in combination with the condensing coil, A, and tanks, B E, constructed and operating substantially as and for the purpose herein shown and described.

[This invention consists in two crescent-shaped hollow vessels which are connected to each other by a series of serpentine pipes passing from the bottom of the upper vessel to the top of the lower one, in combination with an ordinary condensing coil, and with a tank through which a continuous flow of water passes in such a manner that the products of distillation, after passing from the still through the condensing coil, are brought in contact with the cold side of the upper crescent shaped vessel from which the same ran down through the serpentine pipes to the lower crescent-shaped vessel, the bottom of which is kept quite cool by coming in direct contact with a continuous stream of water, and by these means said products of distillation are condensed and cooled without loss and without requiring any attention of the operative.]

44,713.—Loading Attachment for Hay Wagons.—L. M. Doudna, Elmira, N. Y.:

I claim the rotating standard, B, provided with the lever, C, and placed at the rear of the wagon, A, in combination with the hoisting rope, D, and drum, F, the latter being on an adjustable shaft, G, at the rear of the wagon, and connected with and disconnected from one of the wheels, E, of the wagon, as shown and all arranged substantially as and for the purpose set forth.

[This invention relates to an improved loading attachment to be applied to wagons, and arranged in such a manner that the wagon may be loaded as it is drawn along in the field. The invention is designed for loading wagons with hay, grain, fruit, potatoes, etc., gathered in cocks or piles at convenient distances apart in the field.]

44,714.—Folding-table and Toilet Glass.—Henry W. Eastman, Baltimore, Md.:

I claim the combination of the table and toilet glass, substantially as herein described for the purposes specified.

44,715.—Fan Blower.—William Farmer, New York City:

I claim the combination of a screw-formed impeller with a volatile case, substantially as set forth.

44,716.—Potato-digger.—Elias T. Ford, Stillwater, N. Y.:

I claim, first, The combination and arrangement of the two wheels formed with tubes, U U, curved teeth, ax ax ax ax, rotating upon the centers, T T, nearly horizontal upon the dividers, D D, or divider, D, and being upon the angle in entering the ground as a whole, also the centers, T T, tubes, U U, dividers, D D, or divider, D, with or without the colter, H, shaft, J, knives, g g, pinions, f, also frame, C C, sections of frame, cc cc ca ca ct, and bars, Dd Dd.

Second, I claim the arrangement of the gear, G G, upon axle, F, bevel gear, V V, shaft, E, bevel pinion, W W, pinions, S S, yoke, B B, hinged to the sections, cc cc, in front and below the axle, F, in combination with the clutch, K, ratchet, h, slide, Z, spring, b, or springs, b b, and drive wheels, A A, as for the purpose above described.

44,717.—Device for adjusting Reflectors.—Moses F. Gale, Boston, Mass.:

I claim the arrangement and combination of the hinge, m, the rib, h, the cam, g, the toothed annulus, f, and the pinion, i, and its shaft together and with the mirror, A, the tube, B, and the supporting plate or frame, C, substantially in manner and for the purpose as herein before specified.

44,718.—Car Brake.—Wm. D. Goodnow, Albany, N. Y.:

I claim extending the brake bars, F F, over and beyond the jaw braces, f f, and connecting them thereto by means of the yokes, i i, or their equivalents, substantially as and for the purposes set forth.

I also claim in combination with the plank or hang-frame, E, of the car body, and the brake bars, F F, the guide and safety rods, k k, arranged and operating substantially as and for the purposes set forth.

I also claim the combination and arrangement of the brake bars, F F, lever, G G′, connecting bar, N, car-bearing, E, and truck wheels, B B, constructed and operating substantially in the manner and for the purposes shown and described.

44,719.—Base-burning Stove.—James Gray, Albany, N. Y.:

I claim, first, So constructing a base-burning stove that the products of combustion rising frame the fire-chamber will be condensed towards the top of the stove through flues which are formed by cylinders, D and E, and partitions, h, and which are arranged around an ascending warm air flue or flues, substantially as and for the purposes described.

Second, The outer case, c, constructed with horizontal openings, d, vertical openings, e, and arched openings, e′, through it, substantially as and for the purposes described.

Third, The arrangement of the damper, g2 in combination with the three vertical chambers, C D and E, and depressed fire-pot, B, substantially as and for the purposes described.

Fourth, The flexible diaphragm, C1 C2, applied at the base of the coal supply chamber, substantially as described.

Fifth, The flues, b e e1 e2, in combination with the flues, b′ I and G, operating substantially as described.

Sixth, The case, c, in combination with the jacked diaphgram, C1 C2, and supply chamber, C, substantially as described.

Seventh, The combination of the three cylinders, C D E, and escape pipes, J and G, arranged and operating substantially as described.

Eighth, The combination of the two cylinders, C D, with the jacketed diaphragm, e1 e2, openings, e2 e′, substantially as described.

44,720.—Sewing Machine.—M. C. Gritzner, Washington, D. C.:

I claim the transformation of single thread sewing machines into complete double thread sewing machines by means of a combination of two threads with one needle of a sewing machine, when the tension and friction apparatus for each one of the two threads is so arranged as to act independently of the other, while requiring only one adjustment to regulate the tension and friction of each, said combination of parts being applicable to single thread sewing machines as at present constructed, or to single thread sewing machines of new construction, without depriving them of their qualities as single thread machines.

44,721.—Animal Trap.—George L. and Herbert C. Hart, Unionville, Conn.:

We claim the combination and arrangement of the frame, a, jaws, b, pan, h, with its catch, m, and the spring, e, when the pan is set or held directly by the spring, and independently of the jaws, substantially as described.

44,722.—Pneumatic Drills.—Stuart Gwynn, of New-York City:

I claim, first, A machine for boring rocks, etc., operated by steam, air, or other elastic fluid, consisting of a cylinder, piston, hollow piston rod and their appurtenances, rendering the same self-acting, under such an arrangement as that the blow shall be exerted upon a drill bar or its holder, loosely inserted in the hollow piston rod, allowing the drill to remain in contact with the rock, substantially as hereinbefore described.

Second, In pneumatic rock drills, operating as described, I claim the combination of a loose drill rod and hammer, with an automatic screw-feeding device, so as to follow up the drill as the work progresses, substantially as herein set forth.

Third, The method of securing the hollow screw to the hollow piston rod, by means of a reversible nut, constructed and operating in the manner and for the purposes set forth.

44,723.—Shaving the Heads of Wood Screws.—H. A. Harvey, of New York City:

First, I claim the revolving collar or socket, c4, or its equivalent, when adapted to perform the double office of compressing the spring holder to gripe the screw blank, and communicating a rotary motion to the same, constructed and operating in the manner substantially as described.

Second, The combination of such revolving socket with a holder, h, or a series of similar holders, substantially as described

Third, The combination of the revolving socket and holder, described with a cutting tool, whether revolving or otherwise, substantially as herein specified.

Fourth, The combination of the revolving socket and holder described with a yielding pressure finger or its equivalent, for pressing the blank home in the holder and keeping it in that position until it can be griped, substantially as described.

44,724.—Files.—H. A. Harvey, of New York City:

I claim making the teeth of files in segments of circles extending across the face, substantially as and for the purpose specified.

44,725.—Corn-Planter.—G. D. Haworth, of Springfield, Ill.:

I claim the relative arrangement of the rotary colters, F, curved mold boards, G, hoppers, E, dropping mechanism, a b c, and droppers seat, W, substantially as herein shown and described.

44,726.—Artificial Legs.—William Hinds, of Little Falls, N. Y.: Ante-dated Oct. 6, 1864:

First, I claim constructing the inside half of the band securing the top of the socket, A, with a wide flange, as partly shown at d.

Second, I claim the band, b, with the hook, h, and ears, j, fitted to form the knee joint.

Third, I claim the ankle band, y and y′, made with the ears, j, to hinge it to the foot, and shaped to form the ankle joint.

Fourth, I claim the belt, k, spring, m, and strap, n, arranged and connected to the parts, A and B.

Fifth, I claim the appendages, s and i, in combination with the spring, g, arranged as described, and operating across the diameter of the joint, as set forth.

Sixth, I claim the heel piece, F, and rod, o, all of which is constructed substantially as and for the purpose set forth.

44,727.—Sleds.—H. C. Hunt, of Amboy, Ill.:

I claim, first, The two rear runners, B B′, provided with bolsters, D D′, provided respectively with a socket, E, and a tongue, F, fitted together and applied to the bed or platform, A, of the sled, substantially as and for the purpose herein set forth.

Second, The two front runners, G G, provided with semi-circular plates, H H, and secured to the bolster, I, by screws, f; the bolster, I, being provided with a rib, g, having ends to fit into recesses, B, and lap over the edges of said plates in the recesses, substantially as and for the purpose specified.

Third, The bar, J, composed of two equal longitudinal parts, h′ h″, connected together by screws, i, and applied to the front parts of the runners, G G, with the draught rope, K, fitted in, substantially as herein set forth.

[This invention relates to a new and improved sled for the use of children, and it consists in a novel application of the runners to the sled, whereby the same may be readily steered or guided through the medium of a rope, and at the same time a strong, durable, and economical sled obtained. The invention also relates to a new and improved brake for the purpose of stopping the sled or retarding its motion at any time; and it further relates to a new and improved foot rest applied to the front end of the sled.]

44,728.—Horse Rakes.—David G. Hussey, of Nantucket, Mass.:

I claim, first, Attaching the axle, D, to the frame by means of perforated pendant bars, C C, plates, c, and screws, b, substantially as and for the purpose specified.

Second, The holding of the lever, O, in different positions relatively with the wheel, L, by means of the clamp, P, provided with teeth, a, notches, p, in the side of the periphery of the wheel and the screw, r, passing through the slot, s, in wheel, L, with the nut, t, on its end, substantially as described.

Third, The attaching of the arms, h, to the shaft, G, by means of a lock composed of a slide, m, or other equivalent device, in connection with a socket formed of plates, i i, substantially as shown, to admit of a vertical play or movement of the rakes, and also to admit of the elevating of the same by the turning of the shaft, G, as set forth.

Fourth, The attaching of the bearings, F, of the shaft, G, to curved notched bars, E, substantially as shown, to admit of the adjustment of shaft, G, and the rakes, I, as set forth.

Fifth, Securing the tines or teeth, g, to the arms, h, by means of the clamp, B, and bolt, s, as herein described.

[This invention relates to a new and improved horse-hay rake for raking hay in the field, and it consists in the employment or use of a series of rakes, applied to a shaft in a novel way, and arranged and operated in such a manner that they will be under the complete control of the operator, and capable of being operated with the greatest facility. The invention also consists in a peculiar construction and arrangement of certain parts of the device, whereby different axles and wheels of different diameters may be applied to the device.]

44,729.—Cultivator.—C. M. Jenne, of Young America, Ill.:

I claim the securing of the plow, I, to the device, by having its standards, H, attached to a bar, G, which is connected to the inner beams of each pair by pivots, d, substantially as and for the purpose specified.

[This invention relates to a new and improved cultivator for plowing or cultivating corn and other crops which are grown in hills or drills, and it consists in a novel construction and arrangement of parts, whereby the plows may be adjusted laterally and vertically with the greatest facility and at the same time a very strong and durable implement obtained for the purpose specified.]

44,730.—Sash Fastening.—Philip P. Joseff, of Chicago, Ill.:

I claim the latch or catch, D, in combination with the springs, E F, and notch, G, and arranged within the case, C, and applied to the window frame and sash, to operate in the manner substantially as and for the purpose set forth.

44,731.—Atmosphere Cooler.—Moses J. Kelley, of Chicago, Ill.:

I claim the combination of the fanners, F, the system of tubes, T t′ t″, etc., and the ice chest or depository in either of said forms, as and for the purpose shown and represented.

44,732.—Churn.—William W. Lapham, of Decatur, Ill.:

First, I claim the paddle, n, and plate, m, combined with a suitable staff, j, to form a dasher of superior efficacy, as specified.

Second, The arrangement and combination of the movable partition, B, cover, C, tub, A, removable dasher staffs, j, double crank shaft, e, and gear wheels, f h, all constructed and operating in the manner and for the purpose herein set forth.

[This invention relates to an improvement in that class of churns in which the oscillating dashers are used, to which a reciprocating motion is imparted in opposite directions by the action of a double crank shaft.]

44,733.—Curd Cutter.—James H. Maydole, of Eaton, N. Y.:

I claim guiding and controlling the blades of a curd cutter by the

employment and use of auxiliary blades, said blades being jointed to the fixed blades at or near the points thereof, so as to enable the operator to move the opposite ends of said blades to any desired distance from each other, substantially as set forth.

44,734.—Machine for Pressing Watch Crystals.—Joseph Metzgar, of East Cambridge, Mass.:

First, I claim the removable or detachable die, M, in connection with a rising and falling or pressing die, F, and a cup or socket, J, rotary or stationary to hold and retain the die, M, substantially as and for the purpose herein set forth.

Second, The employment or use of jets of gas or other flames and blow pipes, when arranged and used in connection with dies, to operate substantially as and for the purpose set forth.

Third, The hooks, G G', applied to the arbor, C, when used in connection with the removable or detachable die, M, for the purpose herein specified.

44,735.—Process for Removing the Mineral, Gummy and Resinous Substances from Vegetable Material.—Antonio Meucci, of Clifton, N. Y.:

I claim the process of treating a vegetable material in a wet state with the substances produced by the action of nitromuriati cacid upon carbonate of lime and iron, or their equivalents, and then subjecting the vegetable material to the action of a caustic alkali, substantially as set forth.

44,736.—Broom Head.—Charles E. Miller, of Amelia, Ohio:

I claim as a new article of manufacture the metallic broom head, composed of the devices, A B C D E F F', arranged and operating substantially as described.

44,737.—Manufacturing Cans and Boxes.—John W. Millett, of Batchellorsville, N. Y.:

I claim the use or employment of a hollow cylinder or its equivalent, into which a box or can is forced, for the purpose of drawing or pressing the rim of the box or can closely around the top or bottom for soldering or otherwise fastening.

44,738.—Adjustable Template.—William S. Nelson, of St. Louis, Mo.:

I claim, first, The adjustable perforated side bars, B B, in combination with the T-shaped heads, A' A', of the central bar, A, substantially as and for the purpose herein specified.

Second, The adjustable slotted and perforated slides, E E, and central slide, D, in combination with each other, and the central bar, A, substantially as and for the purpose herein set forth.

[The object of this invention is to enable the positions of the holes in the several series or courses of plates in a laminated war turret in the laminated armor of vessels or in other laminated structures to be marked, and the holes to be drilled or punched in each plate separately in a drilling or punching machine instead of requiring the plate to be drilled through several courses of plates after they have been set up together, or of requiring the plates to be carried first to the turret or vessel thence to the drilling or punching machine, and thence back to the turret or vessel, thereby saving much labor; and to this end it consists in a template, composed of a perforated frame with adjustable sides and ends and independently adjustable arms.]

44,739.—Method of Attaching Steel to Iron.—Tertius S. Norton, of Chicopee, Mass.:

I claim my improved steel-facing process, the same being accomplished by brazing and hardening the steel under one and the same heating of it, such as may be requisite for the effective melting of the brazing metal, as specified.

44,740.—Brakes for Hoisting Apparatus.—Charles R. Otis, of Yonkers, N. Y.:

I claim the combination and arrangement of levers and connections, substantially as herein described, whereby the brake is automatically applied, while the valve is closed and withdrawn when the valve is open to set the apparatus in motion.

[This invention consists in so combining the brake of a hoisting machine with the stop valve of the hoisting engine that when the said valve is closed and the steam or other motive fluid shut off from the engine the brake is always in operation, and when the valve is open to admit the steam or other fluid to the engine the hoisting machine is relieved of the friction of the brake.]

44,741.—Rigging Screw for "Turning in" Deadeyes.—William A. Overton, of New York City:

I claim the clasp, D, composed of two or more posts, connected together by joints, C, in connection with the clamps, E E, constructed to operate upon the clasp in the manner substantially as and for the purpose herein set forth.

44,742.—Fruit and Vegetable Press.—Charles Parham, of Philadelphia, Pa.:

I claim the combination of the box or holder, A, with a hinged elastic or yielding cover, F, as and for the purpose described.

I also claim, in combination with the above, corrugating, grooving or channeling the opposite faces of the receiver and the cover, as and for the purpose described.

44,743.—Valve Arrangements for Hose.—Robert A. Parrish, Jr., of Philadelphia, Pa.:

I claim the employment of the curvilinear flexure and elasticity of hose as a lever, or for opening and closing the branch pipe by the agency of any partition or valve, in the manner above described.

I also claim in combination therewith the truncation adjustment and packing of the branch pipe for about half its length with watertight packing, as above set forth.

44,744.—Paper-pulp Hats.—Julius A. Pease, of New York City:

I claim, as an article of manufacture, a hat made of paper pulp, substantially as described.

44,745.—Plows.—Joshua Pierpont, of La Harpe, Ill.:

I claim the bent standard, E, applied to the plow, substantially as shown, so as to admit of the beam being a requisite distance above the mold board and to the left of the land slide, for the purpose herein set forth.

And I further claim attaching the lower end of the standard to the land side by means of a belt, b, passing through an oblong slot in the standard, for the purpose of adjusting the beam in a vertical plane, to regulate the depth of the penetration of the plow, as specified.

[The object of this invention is to obtain a plow of simple construction which will not admit of weeds and trash collecting and wedging in between the beam and mold board, a contingency of frequent occurrence in ordinary plows, and which occasions considerable difficulty and annoyance.]

44,746.—Punches for Attaching Buttons by Rivets.—Edward Pincus and George Rehfus, of Philadelphia, Pa.:

I claim the rod, A, or its equivalent, with a grinding projection, a, in combination with a die having cutting or indenting edges, all substantially as set forth and for the purpose specified.

44,747.—Cultivators.—Edward Pratt, of Grand Detour, Ill.:

I claim the two plow beams, A A, connected together at a proper distance apart by means of bars, D or H, attached to the beams, A, by pivot bolts, a, to admit of an independent longitudinal movement of the beams, A, the latter being used either with or without the central bar, E, and its plow, G, and all arranged substantially as and for the purpose herein set forth.

[This invention relates to a new and improved cultivator designed for plowing corn and other crops grown in hills or drills, and also for loosening land, etc. The invention consists in connecting together two plow beams, arranged in such a manner that each beam will have an independent movement, or one to a certain extent independent of the other, whereby the implement is placed more under the control of the operator than usual, managed with less labor and with less fatigue to the team.]

44,748.—Horse-hay Forks.—Edmond Reynolds, of Corunna, Mich.:

I claim, first, The combination of the rotating box, D, to which the tines of the fork are rigidly secured, with stock, C, substantially as above described.

Second, Constructing the box, D, of two discs, between which are placed the sliding rack, the spring, i, the toothed lever and the pulley, b, for locking and unlocking the parts of the fork, substantially as above described.

[This hay fork belongs to that class which is intended for hoisting hay or straw and carrying the load by means of rope and pulley and a truck or other mechanical devices to a mow, when it is made to release its load, which is then deposited upon the mow or other place, over which the fork has been brought.]

44,749.—Rakes for Harvesters.—Asa B. Rodman, of Lyons, Iowa:

I claim the cam, F, in combination with the levers, L K, the former being connected to the cam and rake head by the rods, M N, and the latter arranged relatively with the cam, F, guide, g, and rake head, H, substantially as and for the purpose specified.

[This invention relates to a new and improved automatic raking attachment for harvesters, and it consists in the employment or use of a cam, a rising and falling and forward and backward moving rake, a lever and connecting rods, all arranged in such a manner as to form a simple and efficient device for the intended purpose.]

44,750.—Saw Mills.—Jos. E. and Jos. C. Rogers, of Lewis Township, Pa.:

I claim the sliding bars, B B, adjustable bars, a a, (with thumb screws) and spring, C C, in combination with the standards, C C C C, and base plate, A, substantially in the manner and for the purpose herein set forth,

44,751.—Mode of Sinking Piles.—Samuel J. Seely, of New York City:

I claim, first, The use of a borer or excavator, constructed and operating substantially as above described, within a tubular pile, in order to facilitate the sinking of such pile by loosening, removing or pressing aside earthy material or gravel from beneath or about the foot of the pile, and then withdrawing the borer and leaving the pile in place for the purpose of forming pile foundations.

Second, The use of a screw borer, with an arm, B, resting on the pile or its equivalent, to facilitate the sinking of tubular piles, by applying the force generated by the rotation of the screw, to draw down the pile, substantially as above described.

Third, The formation of a cement or concrete or similar suitable foundations beneath or about the foot and sides of a tubular pile, by the application of a pressure to such cementing substance while in a soft state, so as to drive it through and out at the foot of the pile, substantially as above described.

44,752.—Preserve Jars.—John J. Squire, of Windsor Locks, Conn.:

I claim, first, Constructing a stopper or cover to a preserving jar or other vessel, so as to form a basin or cup in the neck or mouth thereof, through which is made an ingress hole to allow liquid to flow into the jar, and an egress hole for the escape of air therefrom, substantially as and for the purpose above described.

Second, I also claim the cross-piece, C, in combination with the ingress and egress holes of the bottom of the cover, constructed and operated substantially as above described.

[This invention consists in constructing a basin on or at the top of preserving jars in a novel manner, so as to supply liquid thereto without admitting air, and also in a peculiar method of securing the ingress and egress holes in the basin.]

44,753.—Fastening the Covers of Ink Wells.—Henry M. Sherwood, of Chicago, Ill.:

I claim fastening on the covers of ink wells by means of inclined planes, g g, on the under surface thereof, acting upon corresponding inclined planes on the upper surface of the well itself, in combination with the plane projections, f f, on the cover, and the corresponding grooves, b b, in the rim of the well receiving the same, substantially as and for the purposes herein set forth.

44,754.—Securing Shoes to Horses Feet.—W. C. Stickney and H. B. Taylor, of Putnam, Ohio:

We claim the employment or use of flanges, a a a' a', attached to the plate, B, or directly to the shoe, F, in combination with the straps, C C, and screw, E, when conducted and arranged substantially as and for the purpose set forth

[This invention relates to a new and improved mode of attaching shoes to horses' feet or hoofs, whereby the use of nails for such purpose is entirely avoided, and the shoe at the same time firmly secured to the foot or hoof, and rendered capable of being easily adjusted to and detached therefrom without the aid of a smith or shoer.]

44,755.—Churn.—J. B. Sweetland, of Pontiac, Mich.:

I claim, first, A combination of box, H, shaft, D, and valve, I, constructed and operated substantially as herein set forth.

Second, The box, H, the pinions, n and o, the cog wheels, P and R, the cylinder, S, balance wheel, F, lever, K, and churn, T, the whole arranged, constructed and operated substantially as herein described.

44,756.—Bark Mills.—William Tansley, of Salisbury Centre, N. Y.:

I claim, first, A bark mill which is constructed of a series of stationary grinding rings and a series of rotating grinders arranged in such relation to each other that the grinding and the discharge of the ground bark will take place at the circumference of each runner, substantially as described.

Second, In a bark mill, which is composed of a series of stationary and rotating grinding rings, I claim the employment of breaking teeth, arranged within the circumference of the grinding surfaces, in such manner as to prepare the bark for its reception between said surfaces, substantially as described.

Third, The combination of the bottomless runners B C, with the solid bottom runner, D, arranged and operating in conjunction with a series of discharging rings, substantially as described.

44,757.—Padlocks.—James E. Thomson of Buffalo, N.Y.:

I claim a lock-holder, in combination with a lock, for the purposes and substantially as described.

44,758.—Seed Planters.—Hiram M. Tremble, of Mattoon, Ill. Ante-dated Nov. 2, 1861:

I claim the arrangement of pendulum beams, F F, cross piece, G, seed boxes, H H, furrowing plows, I I, rocking shaft, L, operating valves, j j, pedal, h, pivoted level, K, and wedges, J, all substantially as and for the purposes set forth.

44,759.—Buttons.—Barnett B. Whaley, Brooklyn, N. Y.:

I claim the combination and arrangement of the shank, g, and the disk or plate, a, with the button, f, and the cloth or garment, b, substantially as and for the purpose set forth.

44,760.—Horse Hay Fork.—Frank Wicks, Kansas, Ill.:

I claim the combination and hinged or pivoted connection of the trigger, E, with the brace, D, link, C, and shank, B, so that drawing upon the cord, g, will throw the brace out of its notch or recess, removing all contact or friction between it and the other parts of the fork and thus allow the tines to drop and discharge their load, substantially as herein described and represented.

44,761.—Hay Elevator or Stack Builder.—Frank Wicks, Kansas, Ill.:

I claim the combination of the permanent and braced inclined main beam, A, and the movable, vertical or upright beam, H, furnished respectively with metallic bearings or heads, E G, for the purpose of making a firm structure, and a substantial turning support for the upper upon the lower beam, and for allowing the apparatus to come close up to the stack to be built, substantially as described.

I also claim in connection with the swinging beam and its end pulleys, c, the metallic frame, T, and its pulley, e, above said beam, for the purpose of bringing a portion of the strain more directly to the center of the beam, and to ease off the angle at which the rope would otherwise pass the pulleys, c c, substantially as described.

I also claim the auxiliary post, M, made to be united to the head, E, for the purpose of enabling the user to place or displace and lower the swing beam, when the apparatus is to be moved away or taken down, substantially as described.

44,762.—Corn Planter.—J. B. Woolsey, Bloomfield, Iowa:

I claim in combination with the seed-dropping device the adjustable lever, I, and the hand-lever, M, when constructed, arranged and connected with the working parts of the machine to operate the seed-slide by machine or by hand, as herein shown and described.

I also claim in combination with the seed-dropping apparatus, the cross roof sharper scattering device, g, substantially as and for the purpose herein described.

44,763.—Animal Trap.—John Annis (assignor to himself and Norton Kelsey), Salva, Ill.:

I claim a trap for catching rats and other animals, composed of a box, A, divided into a series of compartments provided respectively with a treadle connected with a sliding door, a bait box and an animal reception box, having a conical wire entrance and provided with a glass to admit the light, all being arranged to operate in the manner substantially as and for the purpose herein specified.

44,764.—Apparatus for Trimming Paper Hangings.—Erastus Boothby, Saco, Maine, assignor to himself and Charles A. Shaw, Biddeford, Maine:

I claim, first, The combination of a rotating head-piece which revolves around a portion of the paper or article to be cut a knife for cutting the paper and a spring for actuating the knife, with the trough or body, K, and wheel, A, or their equivalents, substantially in the manner and for the purposes set forth and specified.

Second, I claim in combination with a rotating head-piece, knife and spring, a clamp, S, constructed and used substantially in the manner and for the purposes set forth and described.

44,765.—Ironing Machine.—Wm. H. Bovee & Charles Partinsky, San Francisco, Cal.:

We claim the combination of the rotary horizontal cylinder, C, with adjustable bar, D, as operated by the lever, F, and the smoothing iron, I, substantially as and for the purpose herein specified and set forth.

44,766.—Artificial Leg.—Thomas James Cain (assignor to himself and William G. and J. Lawrence), Cleveland, Ohio:

I claim, first, The strap, E, spring, F, connecting-rod, H, and spring, J', when arranged and operating as described.

Second, I claim the adjustable hook, I, in combination with the rod, H, and spring, J, arranged and operating in the manner and for the purpose set forth.

Third, I claim the bridge, F', in combination with the strap, E, and springs, F and J', and connecting-rod, H, arranged and operated as specified.

Fourth, I claim the thimble, h, pin, h', and cap box, h'', for the purpose specified.

Fifth, I claim the links, b, rods, b', and springs, c, in combination with the ball and socket joint, D, arranged and operating as and for the purpose described.

Sixth, I claim the bar, P, and heads, p p', when constructed and arranged as described for the purpose specified.

Seventh, I claim uniting the thigh, A, and lower leg, B, by means of the connecting rod, H, joints, H', and m m', as herein specified.

44,767.—Apparatus for Roasting and Treating Ores of Gold and Silver.—Augustine B. Crosby & Robert L. Thompson, Galpin County, Colorado Territory:

We claim the application of the perforated hollow axle substantially as above described for the purpose of furnishing a sufficient supply of air at all points, in the length of the burning cylinder.

We claim the application of the gas chamber with the inclined plane or sole and trap substantially as above described for the purpose of separating the burned solids from the gaseous and vaporous products, without admitting external air so as to vitiate the draught.

We claim the application of a condenser substantially in the manner and of the form above described, for the purpose of condensing the metallic vapors and obtaining a hot dilute solution of acid to aid amalgamation.

We claim the combination of a blower substantially as above described, for the purpose of making an inward draught, with the cylinder, gas-chamber and condenser, so that no metallic vapors may escape before condensation.

We claim the application of grinders made of some soft wood, or any kind of wood, or of any soft material suitable, substantially as above described, for the purpose of grinding burned ores and removing any coatings that may be on the gold particles.

We claim the application of the general combination of the foregoing claims with the previously known arrangements involved, substantially as above described, for the purpose of making a compact, practical, continuous, economical and thorough mode and means of working gold ores.

44,768.—Corn Sheller.—George Goewey (assignor to himself and William Bailey), Philadelphia, Pa.:

I claim the arrangement and combination of the inner frame, F, with one or more yielding concaves, H, a spring or springs, Q, and the rollers, G, in the manner and for the purpose substantially as described.

44,769.—Ore Roaster.—C. H. Griffin, Chelsea, Mass., assignor to himself and Henry A. Breed, Lynn, Mass.:

I claim the combination of the rotary pan or roaster, with the furnace flue passing around the same, substantially as described.

And in combination with the rotating pan, I claim the rotary arms, m, operating in the manner and for the purpose substantially as set forth.

44,770.—Railroad Car Window Fixtures.—John D. Hall (assignor to himself and Osborn Conrad), Philadelphia, Pa.:

I claim, first, The combination of the rod, A, the finger-piece, C, the thumb-piece, B, the box and support, D, the spring, H, the ratchet, E, and the ratch or strip, F, substantially in the manner and for the purposes set forth.

Second, The angular faced rollers, G I J, and the spring, L, with roller, in combination with the angular groove, constructed and operating as and for the purpose described.

44,771.—Button Key.—James Lawrence (assignor to Milo Peck), New Haven, Conn.:

I claim as a new article of manufacture, the within described protected button key.

44,772.—Furnace.—Melchore F. Magliocco, Philadelphia, Pa., assignor to himself and Abraham Anderson, Camden, N. J.:

I claim, first, The casing, H, arranged above the fire-pot and combined with the pipes, c, and the casings, C and A, substantially as and for the purpose set forth.

Second, The plate, L, perforated plate, L', and tubes, f, or their equivalents, arranged in respect to each other and to the fire-pot, substantially as and for the purpose set forth.

Third, I claim the funnel, N, pipe, M, with its damper, d, and plates, L, arranged within the casing, H, above the fire-pot in respect to the latter and the pipe, I, as set forth for the purpose described.

44,773.—Machine for Cutting Bolts.—J. A. Merriman (assignor to himself and E. E. Bowns), Chicago, Ill.:

I claim, first, The brake, E, applied in combination with the ring, g, and dies, e^s, substantially in the manner herein shown and described so that by the application of the brake the dies are opened without stopping the machine.

Second, The spring, g2, applied in combination with the ring, g, and dies, e^s, substantially as herein specified for the purpose of closing the dies.

44,774.—Pearing Machine.—Charles R. Penfield (assignor to himself and George W. Penfield), Lockport, N. Y.:

I claim the combination and arrangement of the movable and stationary dogs, d f, with the drum composed of the planes, c c c, or their equivalents, in such a manner that the planes present themselves successively to the operator, and the dogs clamp the blocks automatically, substantially as herein set forth.

I also claim in combination with the dog, f, the screw-shaft, G, provided with the pinion, n, and the rod, H, provided with the rack or worm, l, the whole being used in connection with the drum, B, substantially as herein specified.

In combination with the rod, H, shaft, G, and dog, f, I also claim the spring cam, I, which yields when the dogs are fully clamped, substantially as described.

I also claim the patterns, L, and friction wheel, P, in combination with the drum, B, cutter, D, and sliding carriage, C, for the purpose of giving form to the blocks, substantially as herein set forth.

I also claim attaching the patterns, L, to the drum by means o

he screw, p, and nib, n, when the same is used in combination with the stops, m, for the purpose of adjusting and holding the latter substantially as specified.

I also claim providing the box, E, with the bearing, t, for the purpose of sustaining the friction wheel, P, independent of the shaft, b, substantially as described.

44,775.—Amalgamating Apparatus.—James N. Phelps (assignor to Phelps's Electro Amalgamating Company), New York City:

I claim, first, In combination with the amalgamating rolls, a reservoir of quicksilver and a conveying mechanism for constantly supplying said rolls with the quicksilver, as described.

Second, And I claim in combination with the quicksilver reservoir, conveying mechanism and amalgamating rolls, the use of chemical or mechanical electricity or galvanism for assisting in coating said rolls, as and for the purpose described.

Third, And I claim combining with the rolls that are constantly supplied with quicksilver, the scrapers for constantly scraping off the amalgam and conveying or directing it to a proper receiver, substantially as described.

Fourth, And I claim delivering the crushed and purified ores, from the muller to the coated rolls, through a narrow slot in the pipe or tube conveying it, substantially as and for the purpose described.

Fifth, And I claim in combination with the rolls, A B, the jackets, M, for holding the ores to the rolls, until taken off by the scrapers, substantially as described.

RE-ISSUES.

1,794.—Truck for Locomotives.—Levi Bissell (assignor to the Locomotive Safety Truck Company), New York City. Patented Aug. 4, 1857:

I claim, first, Connecting the truck with the frame of the locomotive so that it shall be free to move laterally under the frame in combination with the means herein described or their equivalents thereof, by which the weight of the locomotive resting on the trucks acts automatically to resist the lateral motion of the truck and retain it in a central position when running on the straight parts of the track and to aid in restoring it to such position when passing from curved to straight parts of the track, substantially as set forth.

Second, Connecting the truck and body of the locomotive at a point between the axles of the truck and driving wheels, so that the truck may move laterally under the locomotive substantially as described to compel the axles of the truck and driving wheels to assume positions parallel or nearly so with the radii of the curves of the track, or at right angles with the rails on the straight parts of the track, as specified.

1,795.—Grain Separator.—John Gray, Milwaukie, Wis. Patented Dec. 22, 1863:

I claim, first, The combination with "Booth's Compound Shaker," for separating wheat from oats, etc., the movable screen, d, for the purpose of more fully separating the smaller seeds, etc., from the wheat.

Second, I claim in combination with said shaker the screen, d, and back fall, e, for the purposes herein recited.

Third, I claim the application of the slide legs, D, to "Booth's Compound Shaker," for the purpose of elevating and depressing the zinc sleves, C, to any desired angle.

Fourth, I claim the application of the crank power, E, and the eccentric rod, l, to "Booth's Compound Shaker," said crank power and eccentric rod being arranged and attached in manner substantially as above set forth for the purpose of producing upon the machine a quick vibratory motion.

1,796.—Fire Extinguisher.—Wm. Kitson, Lowell, Mass. Patented Oct. 20, 1863:

I claim the employment for admitting water to a cotton or other bin, or other place to extinguish fire therein of a valve or cock, which is opened by means of a weight, which is set free for the purpose, by the ignition of a fuze or other inflammable or combustible material, substantially as herein described.

1,797.—Enema Syringe.—Morris Mattson, New York City. Patented Nov. 19, 1861:

I claim, first, The combination of the elastic self-expanding and self-filling enema syringe bulb, A, and the connector compound of two parts, m and f, or their equivalent so constructed and combined with the bulb, A, as to confine the latter between those parts and at the same time furnish a free opening for the induction and eduction of the fluid not confining myself to the specific form and construction of parts described so long as I accomplish the same result by means substantially the same that is to say the parts being so combined that the elastic bulb of an enema syringe shall be connected to the pipe which forms in whole or in part a connection with one or more of the induction and eduction pipes by the said elastic bulb being clamped or compressed upon or against said pipe or connection and thus forming a tight and durable joint, as set forth.

Second, I claim so constructing the plug, m, and so combining it with the elastic bulb, A, of an enema syringe and the connecting pipe, f, that when the latter is removed for any purpose the plug, m, shall be retained in its place by the elasticity of the bulb, A, secure from accidental displacement, substantially as set forth.

Third, I claim the combination of the elastic bulb, A, the connector, m f, or its equivalent, and one or more flexible tubes, g, either for induction or eduction, substantially as and for the purpose set forth.

DESIGNS.

1,992.—Photographic Album Leaf.—Martin Carty, New York City:

1,993.—Floor Oil Cloth.—J. Taylor Webster, New York City, assignor to Edward Harvey, Brooklyn, N. Y.:

1,994.—Shovel and Tongs Stand.—Charles Zeuner (assignor to M. Greenwood & Co.), Cincinnati, Ohio:

[The following claim appeared in our last week's issue erroneously credited to Julius Thompson; we therefore present it this week properly amended.]

44,679.—Harvesters.—Thomas J. Tindall, of New York City:

First, I claim a main frame of a harvesting machine, constructed with a tubular socket for the axle of the running wheels, in such a manner that the said socket performs the double function of sustaining the said axle and of stiffening the frame transversely, substantially as set forth.

Second, I also claim a main frame of a harvesting machine, constructed with a socket for the tongue, in such manner that the said tongue socket performs the double function of sustaining the tongue upon all of its sides and stiffening the frame longitudinally, substantially as set forth.

Third, I also claim the combination of the cog wheels of a harvesting machine, with still or silent shafts, which are rigidly secured to the frame of the machine, substantially as set forth.

Fourth, I also claim the combination of two of the cogwheels that impart motion to the cutter with each other by means of a saw-toothed spring clutch, so that the cogwheel nearer the cutter remains stationary when the machine is backed, and that the clutch may be operated by a lever to stop the cutter, substantially as set forth.

Fifth, I also claim the combination of the finger beam with the main frame by means of lugs and one of the shafts of the cutter gear, in such manner that the said shaft performs the double function of pinion, shaft and joint pin for the hinge joint, substantially as set forth.

Sixth, I also claim the mechanism for raising and lowering the cutter bar, consisting substantially of a winch, vibrating lever and saw-toothed clutch, combined together and operating substantially as set forth.

Seventh, I also claim the combination of the bevelled wheels together, by means of flanges which engage with each other and prevent the separation of the teeth of the wheels by movement in the direction of the axis of the wheels, substantially as set forth.

Eighth, I also claim the combination of the driving pulley of the reel with the grain wheel, by means of a spring clutch, in such manner that the revolution of the reel stops whenever the said grain wheel runs backward, substantially as set forth.

Ninth, I also claim the combination of a hollow reel shaft with a rod that connects the upper ends of the reel standards, so that the reel turns upon the said rod.

Invariable Rule.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Notes and Queries

R. S., of R. I.—In distilling coal tar the benzole is contained in the naptha of density of 27 or 28 Beaume. The coal tar from the gas works in this city does not contain benzole in sufficient quantities to pay for extracting. Put a little chlorite of lime into your naptha, and if it contains benzole its color will change to a deep purple. Even if your naptha does not contain benzole it is probable that it will prove a superior article for paint and for making varnish.

J. S. B., of N. Y.—If you multiply the square of the velocities of two bodies into the whole of the mass or half the mass, the proportions of the two products will be the same. The meaning of *vis viva*, like other meanings, is settled by authority, and the highest authorities in mathematics define it as one-half the mass multiplied into the square of the velocity.

C. P. L., of Conn.—What is known as paper parchment is made by soaking unsized common paper, such as is used for drawing on, in sulphuric acid diluted with half its volume of water, at 60°, this is well washed in cold water, then immersed in a weak solution of caustic ammonia, and again washed, when dry it is ready for use. It is indestructable by most acids and does not lose strength by wetting.

J. A., of N. Y.—Numbers of inventions for balancing slide valves have been described and illustrated in the SCIENTIFIC AMERICAN. We refer you to them. A common method is to attach a cylinder to the steam chest bonnet, and connect a piston in his cylinder to the back of the valve by links. The area of the piston determines the pressure on the valve.

M. J. L., of Md.—It has been said that Arnold's ink is made by adding a small quantity of sulphate of indigo to common ink, made of sulphate of iron and nutgalls. We have tried a number of experiments to make it in this way, but not with complete success.

J. B. M., of Mass.—Re-cut files are largely used. They are of course somewhat thinner or lighter, but are just as good. In these times every file should be saved and re-cut.

N. B. P., of Ohio.—The amount of dead weight of armor on the *Roanoke* iron-clad, is 1,636 tuns, including turrets, side armor and deck plating. This is from the estimate of the Novelty Iron Works, who put on the plates.

C. O. P., of Vt.—To save your silver, keep your solution as strong as possible, and precipitate with hydrochloric acid.

A. S. C., of N. J.—We are much obliged for your communication, but think we have published as much on that subject as our readers care to peruse.

U. S. N.—The radius of the link in link motion for slide valves is struck from the center of the shaft. The lead is supposed to remain the same, but it is generally increased slightly in cutting off shorter.

L. M., of ——See the "American Encyclopedia" for information on sugar refining, etc., also concerning beet root sugar. We know of no better work.

D. S., of Pa.—It is said that the silvered glass reflectors absorb less light than lenses of the same size.

J. H., of Ky.—We refer you to Volume X., of the SCIENTIFIC AMERICAN, for information on submarine gunnery and the effect of shot fired under water.

Money Received

At the Scientific American Office, on account of Patent Office business, from Wednesday, Oct. 12, 1864, to Wednesday Oct. 19, 1864:—

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Fig. 1

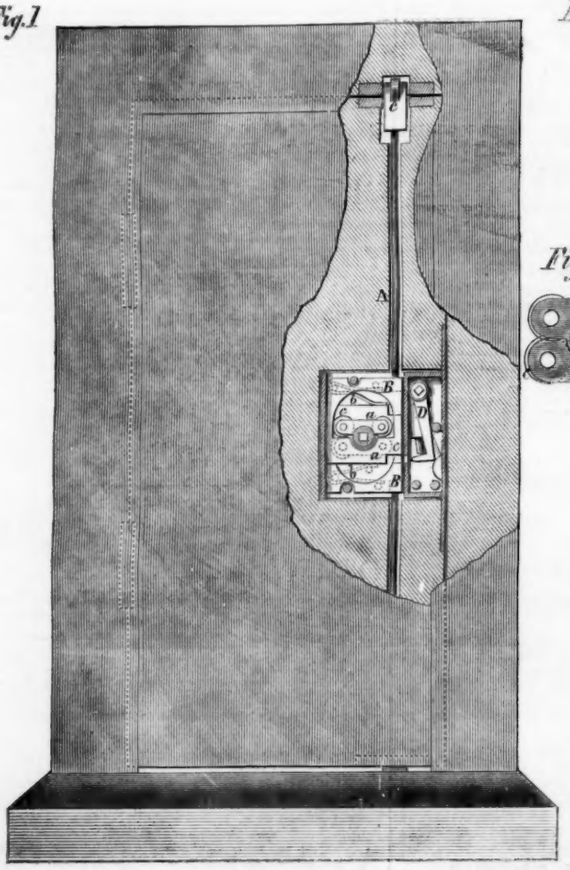

Fig. 2

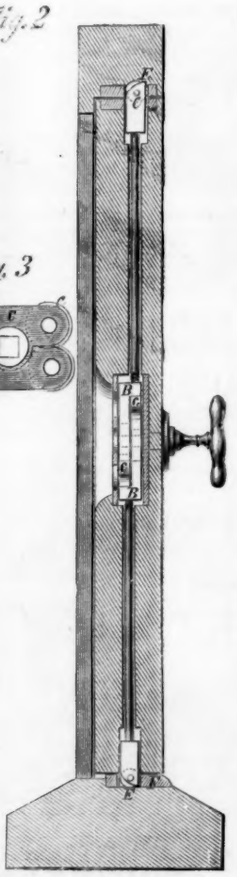

Fig. 3

WILKINSON'S DOOR AND WINDOW FASTENER.

the handle is turned; the springs, *b*, assist the operation by pressing the top frame up and the lower one down There are also friction rollers, C, in the ends of the bolts, and the arms of the revolving barrel, so that the labor on these parts is lessened and the wear rendered imperceptible.

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Patented Sept. 30th, 1864, through the Scientific American Patent Agency, by Henry Wilkinson, of Newburgh, N. Y. For further information address him at that place.

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GEN. GILLMORE is now at Hudson, N. Y., superintending the casting of artillery of a new and approved pattern, devised by himself.

The U. S. Iron-clad "Monadnock."

This vessel is now on her way to Fortress Monroe, in company with the *Brooklyn*. *Massasott* and *Saco*. On the 4th inst., she went down Boston harbor on an experimental cruise, and performed admirably. The weather was fine and the water smooth; she went between 9 and 10 knots, steered well. She is a monitor of two turrets, with 15-inch guns in each, has 2 propellers, one on each side of the rudder, 16 engines, namely, 4 double screw propelling engines, with patent valves, two of Sewall's largest size patent steam-pumps, 4 turret engines. This vessel is built of oak, has 5 inches thickness of armor on her sides, 10 inches on her turrets, and 2½ inches on her decks. Her frame is diagonally cross-braced with iron, and she is built in the best style of workmanship. Mr. Hanscomb the Naval Constructor, designed her; the motive power was planned by Mr. Isherwood, Mr. Ericsson designed her turrets, and Mr. Sprague constructed her hull. As she has thus far proved entirely successful, we give the Navy Department the credit of her production. Capt. John M. Berrien commands her, and is expected to make her do her best against the rebel strongholds.

FROM THE STEAM PRESS OF JOHN A. GRAY & GREEN.